AMERICAN GAS JOURNAL

JUNE, 1937

JUN 11 1937

Here's the EMCO application FOR A MEASURING JOB IN YOUR DISTRIBUTION SYSTEM

REFERENCES	Thousands of satisfied customers among the Utilities and all industry.
EXPERIENCE	Fifty years of building better meters.
EDUCATION	A thorough groundwork in meter fundamentals, plus post graduate work in refinements.
HEALTH	Inherently rugged—built to do the toughest measuring job.
APPEARANCE	Excellent—clean lines, trim finish, no excess bulk.
ADAPTABILITY	Among the complete line of EMCO Tin, Iron, Pressed Steel and Orifice Meters can be found the one best suited for any particular job.
ACCURACY	You can depend on EMCO Meters—they are built to measure accurately, first, last, always.
REMUNERATION	EMCO Meters will work hard and long for surprisingly little. Low maintenance and upkeep costs are due to proper design and superior manufacturing facilities.

JUN 11 1937
GENERAL DIVISION

When you consider the different groups of employees in your distribution system, you can't help considering the mechanical ones—the gas meters you employ—as one of the most important of all. They, and they alone, determine the revenue upon which your profits depend. Quietly and unobtrusively, twenty-four hours every day, these mechanical employees go about their task of recording the gas service delivered by you. Without them there would be no equitable basis for apportioning charges fairly among your consumers. Truly, they are your silent representatives on the premises of your customers.

When you buy meters, then, why not buy them on the same basis as you hire your employees? Here's the EMCO application.

PITTSBURGH EQUITABLE METER CO.

MERCO NORDSTROM VALVE CO.

MAIN OFFICES PITTSBURGH, PA.

NEW YORK · LOS ANGELES · TULSA · HOUSTON · MEMPHIS · BUFFALO
COLUMBIA · KANSAS CITY · CHICAGO · PHILADELPHIA · ATLANTA · OAKLAND

Why Reverse Flow *Improves* .. Water Gas Operation

• • *In the Semet-Solvay Reverse Flow Water Gas Machine,* blue gas travels through the carburetor and superheater in the direction that it naturally should under physical laws. The carbureting oil moves downward—also its logical direction—until converted to gas, after which it joins the upward stream of blue gas in the open carburetor.

Prevents Carbon Trouble—Carbon particles from heavier oil fractions settle in a thin layer over a large area on the checker-brick near the bottom of the carburetor. Located in the zone of highest temperature, the carbon deposits will either react with superheated backrun steam to form gas or be consumed during the blast.

Improves Backrun Operation—Reverse Flow gives the backrun steam the full benefit of the superheater surfaces and reaches the generator fuel bed at higher temperature than ever before. This further increases the efficiency of the set.

Modernizes Present Equipment—The Reverse Flow Process merits the careful attention of plant operators in need of new units to meet increased load demand, or who can profit by modernizing present equipment to obtain greater efficiency and reduce gas making costs.

SEMET-SOLVAY
ENGINEERING CORPORATION
Engineers — Contractors
40 RECTOR STREET NEW YORK, N. Y.

AMERICAN GAS JOURNAL, June, 1937. Vol. 146, No. 6. Published monthly by American Gas Journal, Inc., at 34 North Crystal St., East Stroudsburg, Pa. Executive and Editorial offices at 53 Park Place, New York, N. Y. Entered as second-class matter, October 7, 1928, at the post office at East Stroudsburg, Pa., under the Act of March 3, 1879.

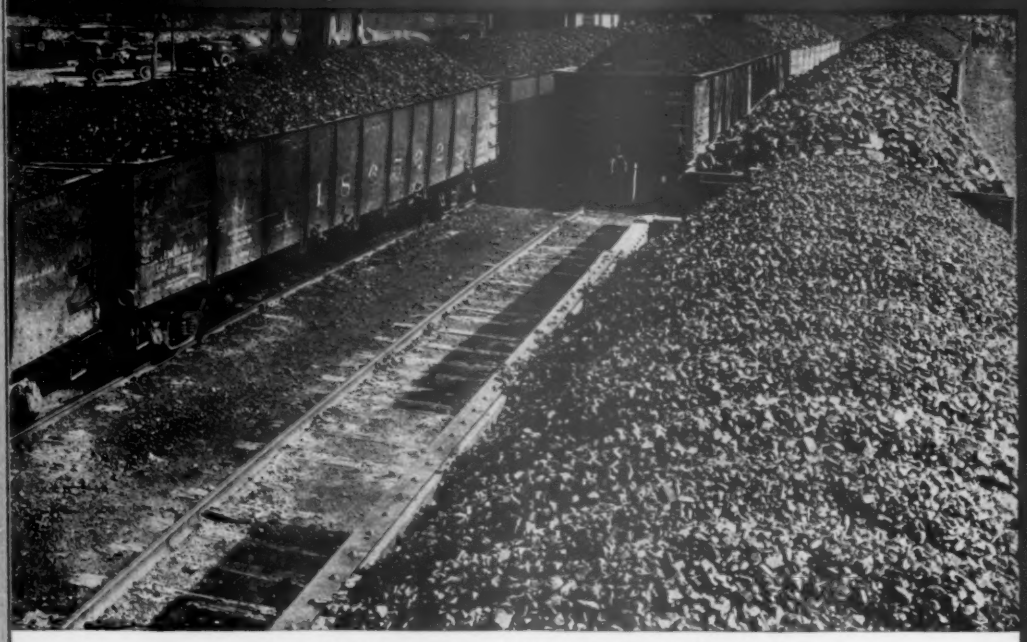
"THERE'S NO GUESSWORK ON A DRESSER-COUPLED LINE — THE JOINTS ARE FACTORY-MADE"

Note to Reader
This is the fifth in a series of advertisements dramatizing one engineer's experience with his first Dresser-coupled line. For the complete story, write for Bulletin No. 351.

On a Dresser-coupled line, everything is *standard.* There are no "variables" to go wrong—nor to worry about. "*Factory-built*" joint parts are simply assembled, *not fabricated,* in the field. • Dresser Couplings can be field-assembled in only one way—the *permanently tight* way! Chances for human error are eliminated. • And—because only one tool (a wrench) is required—ordinary laborers can easily do the trick!

S. R. DRESSER
MFG. COMPANY · BRADFORD, PA.
In Canada: Dresser Mfg. Company, Ltd., 60 Front St., W., Toronto, Ont.

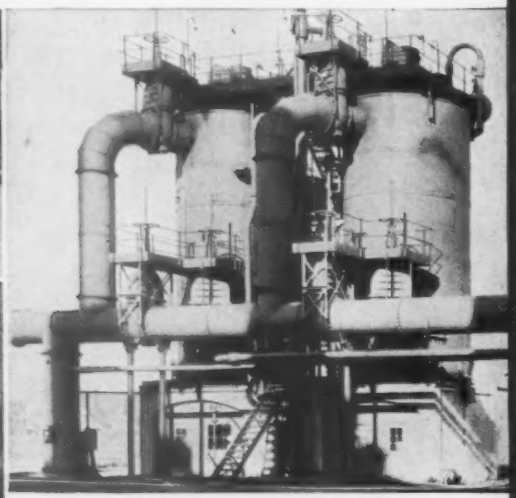
KOPPERS
serves the gas industry



KOPPERS SELLS THE KIND OF COAL ITS OWN OVENS USE

An important reason why Koppers coals are uniformly excellent for gas-making is found in Koppers own activities as a large gas producer. The 25 Koppers coal mines are located in fields of known high quality, and every modern facility is employed to prepare these coals for market. In addition, daily laboratory tests are made of all shipments to insure that both Koppers and its customers are served with a product which meets Koppers exacting standard.

Koppers Roofs are Bonded for Definite Wear—Because Koppers Coal Tar Pitch and Tarred Felt withstand prolonged contact with water, a Koppers roof can be guaranteed for 10, 15 and 20 years of satisfactory service. Koppers roofs show concrete savings on pump houses, repair shops, office buildings—any flat-deck structure.



Koppers is Outstanding in the Gas Equipment Field—Bartlett Hayward Division of Koppers Company built the Feld Type gas scrubbers shown here. They are designed to handle 50,000,000 cubic feet of gas daily, removing from it tar, naphthalene, cyanogen, ammonia, light oils and other desired by-products. Koppers introduced to this country the waterless gas holder, and controls numerous patents on other important gas-making equipment it supplies.

Principal Koppers Products Serving the Gas Industry

MECHANICAL TIME CYCLE CONTROLS
COKE OVEN PLANTS
WATER GAS SETS
HEAVY OIL WATER GAS PROCESSES
SCRUBBERS
CONVEYING SYSTEMS
FAST'S SELF-ALIGNING COUPLINGS
TREATED LUMBER
FLOOR STANDS
FIRE HYDRANTS
GAS PURIFICATION PLANTS
MOTOR FUEL RECOVERY PLANTS
OIL FOGGERS
BITUMINOUS PAINTS
COAL TAR PITCH AND FELT ROOFING
WATERPROOFING MATERIALS
PIPE
AMERICAN HAMMERED PISTON RINGS
COAL TAR PAVING MATERIALS
SULPHUR RECOVERY
GAS HOLDERS
TANKS
GAS, AIR, TAR AND WATER VALVES
DISINFECTANTS
INSECTICIDES
DEODORANTS

Koppers Divisions, Subsidiaries and Affiliates Serving the Gas Industry

AMERICAN HAMMERED PISTON RING DIVISION — BALTIMORE, MD.
BARTLETT HAYWARD DIVISION — BALTIMORE, MD.
ENGINEERING AND CONSTRUCTION DIVISION — PITTSBURGH, PA.
GAS AND COKE DIVISION — PITTSBURGH, PA.
TAR AND CHEMICAL DIVISION — PITTSBURGH, PA.
WESTERN GAS DIVISION — FORT WAYNE, IND.
EASTERN GAS AND FUEL ASSOCIATES — BOSTON, MASS.
THE KOPPERS COAL COMPANY — PITTSBURGH, PA.
KOPPERS-RHEOLAVEUR COMPANY — PITTSBURGH, PA.
NEW ENGLAND COAL AND COKE COMPANY — BOSTON, MASS.
THE WHITE TAR COMPANY OF NEW JERSEY, INC. — KEARNY, N. J.
THE WOOD PRESERVING CORPORATION — PITTSBURGH, PA.
NATIONAL LUMBER AND CREOSOTING COMPANY — TEXARKANA, ARK.

ENGINEERING AND CONSTRUCTION DIVISION

completes outstanding new gas plant at Indianapolis

As part of its service to the gas industry, Koppers welcomes opportunity to give individual members the benefit of its wide experience in solving any particular problem.

MODERN in every respect, and capacitated to handle any possible emergency, the new water gas plant recently completed by the Engineering and Construction Division of Koppers Company for the Citizens Gas and Coke Utility, Indianapolis, is another Koppers achievement of which we are proud.

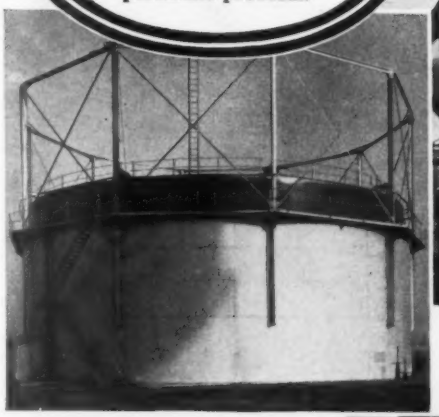
Designed as auxiliary to an existing coke-oven gas supply, the new plant will deliver mixed fuel gases to the ovens and water gas to a surplus gas system, with provisions for extreme flexibility in the various B.T.U. values desired. The installation will regulate accurately not only the B.T.U. value of gas produced in the several generators, but also the values of mixed gases used for underfiring the ovens and for service supply.

Three 11'0" diameter water gas sets (designed and manufactured by Western Gas Division of Koppers Company) provide the new plant with a rated capacity of 7,500,000 cubic feet daily.

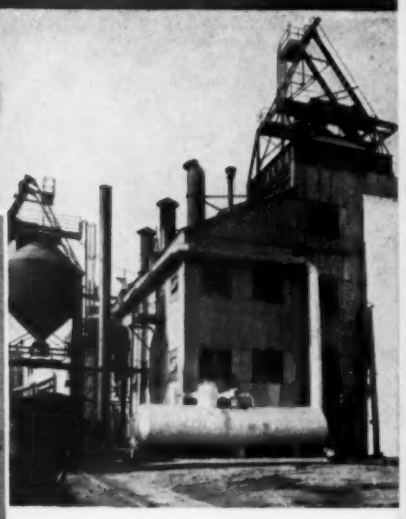
On two of these sets, a distinctive feature is the WESTERN "ABC" Self-clinkering Generator Grate which permits continuous operation in excess of 23 hours per day, and gives increased capacity with lowered costs for fuel and labor.

Other WESTERN equipment for modern processes of gas manufacture is outstanding in this new plant. Pictured on this page are a few of the Koppers features embodied in its construction.

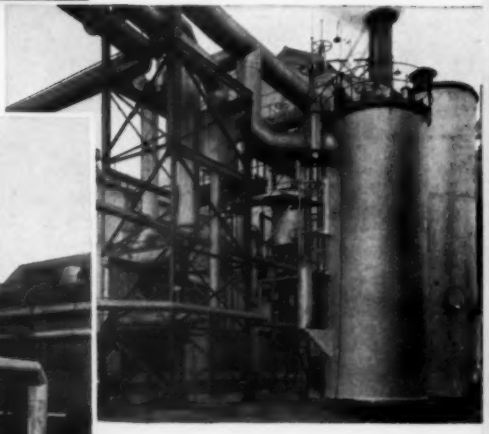
KOPPERS COMPANY



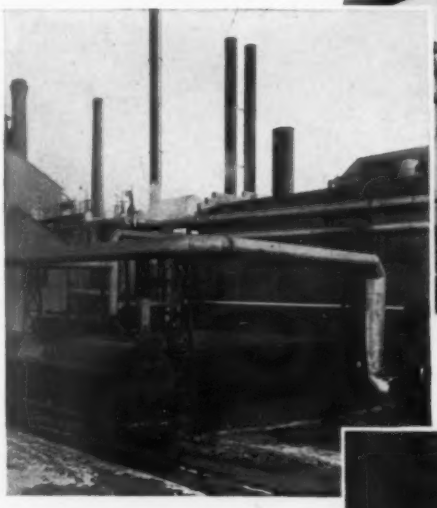
Relief holder of riveted and welded steel plate construction, with 150,000 cubic feet capacity.



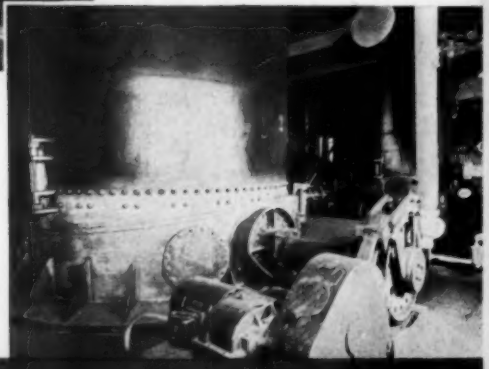
Exterior of generator building, showing steam accumulator tank, fuel-handling skip, waste heat boiler stack, etc.



Exterior, showing tar extractor, condensers, waste heat boiler and piping. Note WESTERN Gate Valves in gas lines.



Tar separator tank, with three separating and three filter compartments, the latter to remove tar from water overflowing to the sewer.



General view on clinker floor, showing two 11'-0" cone bottom generators equipped with WESTERN "ABC" Self-Clinkering Generator Grates.

DESIGNERS BUILDERS PRODUCERS MANUFACTURERS OPERATORS DISTRIBUTORS

Installation and operating conditions in distribution service are not what they were a century ago, but cast iron pipe maintains its traditional efficient service. Abreast of every advance in metallurgy and resourceful in the development of modern joints, CIPRA members furnish the gas industry with the same long-lived, economical pipe equipped with bottle-tight mechanical joints for modern operating conditions. Sizes from 1¼ to 84 inches.

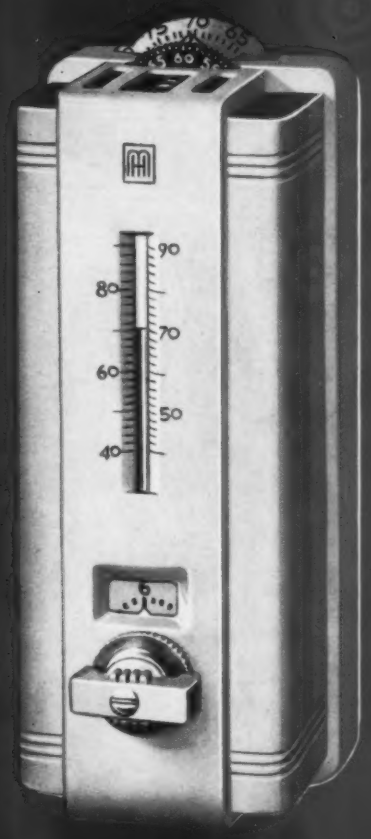
CAST IRON PIPE

THE STANDARD MATERIAL FOR UNDERGROUND MAINS

The Cast Iron Pipe Research Ass'n, Thos. F. Wolfe Research Engr., 1013 Peoples Gas Bldg., Chicago

The Da-Nite Acratherm LISTS at...

only $10 more



GIVE YOUR CUSTOMERS THE ADVANTAGE OF LOWERED NIGHT TEMPERATURE AND AUTOMATIC MORNING PICKUP . . . .

● The new Minneapolis-Honeywell Da-Nite Acratherm is the only control that offers, in one instrument, the economy of manually lowered temperature with automatic return, and the accuracy of control provided by the exclusive M-H Heat Acceleration priciple. Yet it costs your customers only $10.00 more than the Acratherm. They benefit by increased satisfaction with automatic heat. You make an extra profit. So recommend and install the Da-Nite Acratherm. Minneapolis-Honeywell Regulator Company, 408 East Twenty-Eighth St., Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWELL *Control Systems*

BROWN INDUSTRIAL INSTRUMENTS • NATIONAL PNEUMATIC CONTROLS

Outstanding!
among
Gas Purifying
Materials

Highest H_2S removal combined with complete removal of traces. Physical Structure insures very low box back pressures.

THE RECOGNIZED PURIFYING MATERIAL FOR VAPOR PHASE GUM CONTROL.

Write for interesting Bulletins AL-18 and 19

THE ALPHA-LUX COMPANY, Inc.

192 Front Street, New York

PHILADELPHIA **CHICAGO, ILL.**

JUN 11 1937 ©CIB 339900

VOLUME 146
NUMBER 6

AMERICAN GAS JOURNAL

WHOLE
NUMBER 3762

ESTABLISHED 1859

JUNE, 1937

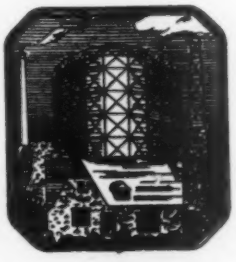
Contents

Natural Gas Division of A.G.A. Holds Annual Meeting 11
Home Service Activities—Jessie McQueen 14
The Kansas City Exhibits 15
Gas Hydrates In Natural Gas Pipe Lines—W. M. Deaton and E. M. Frost 17
The Use of Anhydrous Ammonia to Inhibit Gas Hydrate Formation—J. T. Russell 22
Ways to Avoid Liability for Explosions of Gas—Leo T. Parker 29
Dust Proofing Coke with Cold Oil Spray—I. J. True 33
Use of Oil for Dust Proofing Coke at Springfield—C. H. Thorington 35
Dustless Coke—R. C. Downing 35
Eleventh Annual Conference of A.G.A. Production and Chemical Committees 37
The Economics and Operation of Automatic Grates—R. H. Arndt 38
Some Aspects of the Flexibility of Plant Control with the Heavy Oil Process—W. E. Lebo 41
Proposed Combination of Blue Gas Production and Oil Cracking Process—E. A. Dieterle and Leon J. Willien .. 44
Effect of Cyanogen-Organic Sulphur Upon the Stoppage Problem—E. J. Murphy and A. R. Bayer 44
Crushed Coke Size as Affected by Coke Breeze Admixture to Coal Prior to Carbonization—F. J. Pfluke 45
Treatment of Holder Waters to Eliminate Paint Discoloration—John R. Skeen 46
Blending of Certain High-Volatile Coals with Beckley Red Coal and the Effect on the Yield and Quality of Carbonization Products—Joseph D. Davis and Clarence R. Holmes 46
The Benefits of Employee Selling to the Employee and the Company—S. B. Severson 47
Management's Customer Relations Job—Blackwell Newhall .. 53
Pipe Corrosion and Coatings—Part 12—Corrosion Survey—Erick Larson 63
Diaphragm Meters—Operation and Design—Part 2—Allen D. MacLean 69
New Equipment and Appliances 74-75
News of the Industry 77
Public Utility Standpoint on Credit Merchandising 84

PUBLISHED MONTHLY BY
AMERICAN GAS JOURNAL, Inc.
53 Park Place, New York

S. G. KRAKE, *Publisher*
A. M. GLEASON, *Secretary*
A. I. PHILLIPS, *Editorial Director*

ADVERTISING REPRESENTATIVES:
THOMAS MORGAN, *168 N. Michigan Ave., Chicago, Ill.;* HARLEY R. MANKIN, *515 Guarantee Title Bldg., Cleveland, Ohio*



Copyright 1937, American Gas Journal, Inc.

Subscription $2.00 per year U. S. A.; $3.00 Canada; $4.00 Foreign. Single copies, 25 cts.

New American *Soldered Seal* Index Frame & Glass

(PYREX BRAND)

ANOTHER GREAT STRIDE in low-cost maintenance . . . a permanently leak-proof index box mounting that perfects still further the advantage of the **AMERICAN** Tinned Steelcase Meter as a sealed instrument!

The index glass is resistant to extreme heat and will eliminate breakage, due to the character of the glass and the design of the index frame.

For equipping meters in the repair shop, the glass and frame are available only as a complete unit. The metal sealing is done in the Albany factory by a special process whereby flowing solder produces a flawless seam without the use of a soldering copper.

The technique of fabrication—including careful preparation and temperature control—makes centralized manufacture, assembly and inspection a prerequisite to successful results.

Now available for **AMERICAN** Tinned Steelcase Meters utilizing the 3 or 4-circle indexes.

In battered customer relations alone . . . apart from money-savings . . . the slightly higher initial cost of this permanent index box assembly makes it a decidedly profitable investment.

More detailed information will be promptly furnished on request.

Established 1836

AMERICAN METER COMPANY

INCORPORATED

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK, N. Y.

813

JUNE
1937

AMERICAN
GAS JOURNAL

VOLUME 146
No. 6

Natural Gas Division of A.G.A. Holds Annual Meeting

THE Natural Gas Division of the American Gas Association held its annual meeting the week of May 10th in the Municipal Auditorium, Kansas City, Mo. The Association of Gas Appliance and Equipment Manufacturers held an exhibit at the same place and time.

The first General Session was held Monday afternoon. George E. Welker was Chairman. Herman Russell, President of the American Gas Association, addressed the meeting on the subject of a survey recently completed in the territory covered by the Rochester Gas & Electric Company, of which Mr. Russell is president. Up to that time, only a small part of the survey had been compiled, but it showed some very interesting data. The complete survey will be available to the industry when it is finished.

ALEXANDER FORWARD

Major Alexander Forward, Managing Director of the A.G.A., stated that the Association had inaugurated a Kitchen Planning Department. Harry Swenson of the Peoples Gas Light & Coke Company, Chicago, is Home Modernization Counsellor of the Commercial Section. He said that space planning, up-to-date efficiency methods and sane principles of decoration have organized the kitchen for modern living, and it is a subject of national importance to the gas industry.

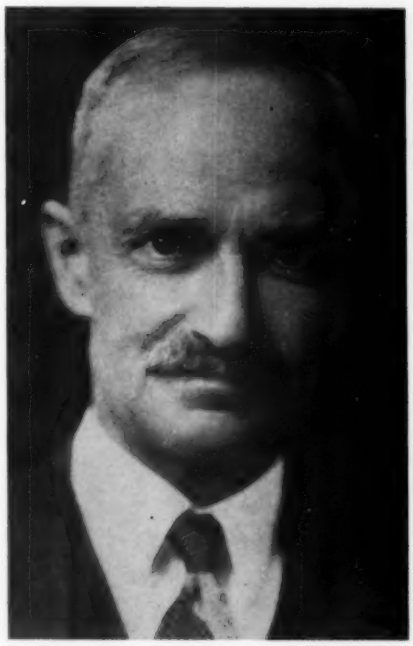
In 1910, a few natural gas men formed the Natural Gas Association of America. Three of the charter members of this Association were present at Kansas City. They were: Maurice W. Walsh, Louisville, Ky.; James F. Owens, Okla. City, Okla.; and W. H. McKenzie, Kansas City, Kans. The first meeting was held in Kansas City and Mr. McKenzie was the president in 1910.

Tuesday morning the General Session was given over largely to the reports of various committees. H. C. Cooper of Pittsburgh, Pa., was the Chairman.

The Wednesday morning meeting, under the chairmanship of Robert W. Hendee, included a paper on "Hydrates," read by W. M. Deaton, United States Bureau of Mines, Amarillo, Texas. This paper appears elsewhere in this issue of the JOURNAL.

T. J. Strickler, Chairman of the National Advertising Program, outlined the progress of the program and what had been accomplished since its inception in September, 1936, to the present time. He said:

"An important change already has taken place in the mental attitude of newspaper and magazine editors and the program directors of radio stations toward the gas business. In the jargon of the day, we are getting a break. And all because our publicity activities have clicked from the start.



HERMAN RUSSELL

"As a result, the gas business has been represented editorially in magazines and newspapers during the last year as never before. You have seen the February "Delineator," the February "Ladies' Home Journal," the March "McCall's," the November "American Home," the November "Pictorial Review," and other class magazines which have carried interesting articles on gas. Their editors are conscious of the news value of gas. Where a year ago their attitude was distinctly unsympathetic, it is today definitely cooperative. Where a year ago magazine editors thought of the modern kitchen in terms of electric cooking, today their thinking has been changed.

"I think you will agree with me that you cannot picture modern gas equipped kitchens in newspapers, which are read by millions of persons, without impressing a large percentage of these persons. You cannot mention modern automatic gas ranges and talk editorially of the multiple features of gas for cooking, in newspapers, without making readers of these papers conscious of the virtues of gas."

ROBERT W. HENDEE
Chairman
General Session

B. M. NOWERY
Chairman, Natural Gas
Production Committee

HALE A. CLARK
Chairman, Industrial Gas
Conference Committee

The Natural Gas Production Committee Meeting was held Wednesday afternoon, B. M. Nowery, Chairman. One of the interesting papers presented at this meeting was entitled, "Prolongation of the Life of Gas Wells," read by L. A. Farmer, Oklahoma Natural Gas Company, Tulsa, Okla. Another paper entitled, "Increasing the Flow from Small Producing Gas Wells," was read by S. W. Meals, Carnegie Natural Gas Company, Pittsburgh.

Wednesday afternoon the Natural Gas Utilization and Sales Promotion Committee Meeting under the chairmanship of H. Cuthrell, The Brooklyn Union Gas Company, Brooklyn, N. Y., was held. C. E. Bennett, Chairman of the Committee was unable to attend. Mr. Cuthrell was requested to act for him. L. A. Bickel, Dallas Gas Company, Dallas, Texas, read a paper on the "Developments in Commercial and Domestic Air Conditioning." He explained the various types of equipment which should be used in successful installations. A paper entitled, "Employee Selling," by S. B. Severson, Republic Light, Heat and Power Co., is included elsewhere in this issue.

The Thursday morning General Session was devoted to the reading of several papers, including one by J. C. Reinbold, Panhandle Eastern Pipe Line Company, Kansas City, Mo., entitled, "Maintaining High Efficiencies in Pipe Lines." This paper was discussed by J. L. Foster, Lone Star Gas Company, Dallas, Texas, and J. W. Ferguson, Colorado Interstate Gas Company, Colorado Springs, Colo.

In a paper read by B. H. Gardner, Columbia Gas & Electric Corp., Columbus, O., on the subject, "Sales Objectives—Domestic and Industrial," Mr. Gardner summed up as follows:

"When we consider all of the facts, we can see that to meet fully our sales responsibilities and opportunities calls for something more than a desultory or haphazard appliance activity. The situation calls for no half-thought-out plans or half-hearted efforts. It seems to me that our sales objectives for our domestic business might be summarized in a very few words. Briefly, these objectives would be to protect our present competitive situation as regards the cooking load, to increase sales and revenue per customer, and to improve our load factor. Only a few words, easily said, but representing a tremendous accomplishment,—one that demands, and will merit the best thought and effort of our industry."

The Natural Gas Utilization and Sales Promotion Committee held their second meeting Thursday afternoon. W. M. Jacobs, Southern California Gas Company, Los Angeles, read a paper entitled, "Gas Refrigeration Sales Methods," which was ably discussed by C. B. Wilson, Arkansas Louisiana Gas Co., Little Rock, Ark. Lyle C. Harvey, The Bryant Heater Company, Cleveland, O., read a paper, "New Developments and Designs in Domestic Appliances Which Are Now Available." A. L. McKinstry, Cedar Rapids Gas Company, Cedar Rapids, Iowa, read a paper on the subject of "Water Heaters," and Frank L. Adams, Public Service Company of Colorado, Denver, Colo., read a paper on the subject, "Promoting Gas House Heating."

The meeting of the Natural Gas Transmission Committee, F. F. Doyle, Chairman, was held Thursday afternoon and the entire meeting was given over to the discussion of "Recent Developments in Gas Compression Machinery."

The Industrial Gas Conference Committee held their meeting also on Thursday afternoon, Hale A. Clark, Chairman.

"Specialized Selling of Natural Gas," was the title of the first paper presented by Henry O. Lobell, Natural Gas Pipeline Company of America, Chicago, Ill., in which he stated:

"It is the feeling of the Committee that in the cities in which natural gas has been distributed for many years, the smaller industrial and commercial users of fuel have not received adequate consideration from the gas companies and as a result a source of additional income has been neglected.

"It is obvious that this condition exists only where management is concerned primarily with the opportunities in the larger manufacturing establishments or in industries where large volumes of fuel are used and for which they provide the personnel for contacting the industries and the competitive rates to attract this large business, — leaving the small user to his own initiative if he wants gas for his heat requirements.

"It is obvious that sales and engineering service cost money and this expense must be justified, either by increased load or increased rates. Increasing rates is a ticklish proposition and except in isolated cases is somewhat a dangerous procedure. Increasing business by serving all po-

HUGH H. CUTHRELL

tential customers and also making sure the existing load will stay with you is, of course, not only desirable but very vital.

"Therefore, the problem is one of ascertaining first the value of the load that these potential customers offer and, second, the cost of an adequate sales service to meet the needs of this class of customers—a service that would be advantageous to the customers and profitable to the company.

"To determine the value of this load we must have certain specific information and in order to obtain it we must ask questions, see the equipment used, study the conditions under which it is used, and understand the problems of these customers.

"One of the weaknesses of our industry is that it believes it knows all the facts about its customers and it is generally greatly surprised when some customers change to other fuels. The facts are, however, that generally speaking our industry seldom asks questions of its customers and unless some difficulty develops and needs adjustment, we leave our customers alone. Many companies do not maintain periodic contacts with all fuel users—customers and otherwise—and because of that it is practically impossible to determine the values that may accrue to a company from the sale of gas in these specialized uses.

"The only practical way to establish the values of this potential business is through a detailed survey of all the fuel users in the community."

Following is the Report of the Committee on Final Resolutions:

"A successful Convention such as we have just enjoyed lasts only a few short days but requires many months of hard work and detailed planning. The success of this Convention of the Natural Gas Department of the American Gas Association held in Kansas City, Missouri, May 10-14, has been due in great measure, to a year's tireless effort on the part of the officers of the department headed by George E. Welker, Chairman; Robert W. Hendee, Vice-Chairman; and A. E. Higgins, Secretary; Managing Director Forward, and his able staff in New York and Dallas.

"We, the Committee on Final Resolutions, offer the following resolution:

"RESOLVED, That appreciation is hereby expressed for the splendid work and cooperation of the officers and members of the Kansas City Gas Company in making this Convention so pleasant and successful.

Two Charter Members of The Natural Gas Association, James F. Owens of Oklahoma City (left) has a chat with Maurice W. Walsh of Louisville, Ky.

"We commend and wish to express our appreciation for the work and effort of T. J. Strickler, general chairman; C. D. Greason, chairman of the Publicity Committee; P. C. Ford, chairman of the Banquet and Entertainment Committee; Ray T. Ratliff, chairman of the Attendance Committee; and Mrs. B. C. Adams, chairman of the Women's Committee. We also wish to express our appreciation to all of the members who served on these various local committees.

"To Mayor Bryce B. Smith, and Judge Henry F. McElroy, City Manager, and the many other city officials, we express our appreciation for the many courtesies they extended us during our visit. We further wish to thank the complete staff of Kansas City's new Municipal Auditorium. Their contribution to the success of the Convention is much appreciated. The citizens of Kansas City are to be congratulated upon having such a beautiful Auditorium and are indeed fortunate in having such an efficient staff in charge.

"BE IT FURTHER RESOLVED, That the Association expresses its appreciation for the continued splendid work being carried on by the Main Technical and Research Committee and its sub-committees, under the able and efficient leadership of H. C. Cooper. To all of the chairmen of the various committees and their members, we wish to express our appreciation and thanks for their work during the past year."

E. HOLLEY POE
Secretary Natural Gas Department of A.G.A.

E. Holley Poe, of Tulsa, Oklahoma, has been appointed secretary of the Natural Gas Department of the American Gas Association, succeeding Captain A. E. Higgins, of Dallas, Texas, who resigned to become vice-president of the Pittsburgh Equitable Meter Company, Pittsburgh, Pa., it was announced at the annual convention of the department.

The office of the Natural Gas Department will continue to be in the Dallas Gas Building, Dallas, Texas, and Mr. Poe will make his headquarters there.

Gas Ranges Have a Wide Public Acceptance

The San Francisco Division of Pacific Gas and Electric Company has issued a letter-size booklet outlining 1937 sales opportunities for gas and electric appliance dealers. It is being sent to dealers as a summary of points brought out in a series of dealer-company dinner meetings held earlier in the year. Included are tables and charts showing appliance sales during the past three years and peaks in sales brought about by campaigns. Each major appliance is discussed separately. Of gas ranges the booklet says:

"Gas ranges probably have greater public acceptance than any other appliance, gas or electric, in which we in the industry are interested. In the face of this wide acceptance, however, it shows more response to a cooperative promotional effort than any other household appliance."

In connection with saturation the Pacific Gas and Electric Company estimates that 89.8 per cent of its domestic gas customers are using gas ranges and 70.5 per cent automatic or tank water heaters.

Home Service Activities At Natural Gas Meeting

By Jessie McQueen

Home Service Counsellor
American Gas Association

HOME SERVICE has won its way into the limelight of A.G.A. programs by its ability to schedule a Breakfast meeting in the midst of a Convention, and have it rewarded with an excellent attendance. There was no exception in Kansas City at the Natural Gas Convention. Eighty-six were present, with sales managers in the majority. Greetings and good wishes were extended by Herman Russell, President of the American Gas Association; Alexander Forward, Managing Director; and George E. Welker, Chairman of the Natural Gas Department.

Home service activities under way were developed in a series of short talks by home service directors. Mildred Clark of the Oklahoma Natural Gas Company in her subject "Home Service Sells Natural Gas" stated that it did this with three objectives, namely: "making customers"; "aiding the sale of modern gas appliances"; and "creative selling." She stated that the home call activity was the most essential as it gave first hand information on what women desire in equipment, on what they are having difficulty with, and how best the gas company can give service thus making satisfied customers. Miss Clark also mentioned that in setting up a home service department it was essential that a new person coming in should be allowed time enough to understand the policies within the company organization before being sent out into the homes of customers. At the start, too, it was necessary to work out a plan of adequate records so that the information secured by home service in customer contacts could be made available for use by others in the company from the top executive down through the sales department and to other service people.

Mrs. Vera Ault described the Gas Hospitality House set up in the Denver office of the Public Service Company of Colorado. The lack of dramatic appeal in putting over the gas story was particularly felt in a combination company and so this house was built strictly as a promotional

JESSIE McQUEEN

activity, "breaking the trail" for the sales department. Mrs. Ault stated that there has been a noticeable increase in public interest in gas; that there has been a significant increase in dealer advertising of gas appliances; and that at least 85% of the heating equipment sold by dealers to new homes is gas designed.

In the Gas Service Company through Kansas the popular form of home service work is that of group demonstrations given either in a home, a church parlor, or a club room. Betty Boyle of this company in describing the details of this group plan states that the best results are obtained in the homes where the hostess invites her own guests and the home service director prepares foods chosen to show the spectacular features of modern gas cookery. In St. Louis, Mrs. Mary Hurster of the Laclede Gas Light Company stated their new plan of giving service to new purchasers of gas ranges, featuring a special cookery demonstration for those people upon invitation.

Home service directors run into many amusing experiences in their home call work, and it has been discovered in calling on purchasers of new gas refrigerators that the women, because they are using for the first time a fully automatic appliance, have developed some startling experiences. Some of these stories were interestingly told by Leone Waddell, Assistant Home Service Director of Servel, Inc. In one instance a home service girl was called on the complaint that the refrigerator worked too fast, stating that the ice cubes were formed so quickly that the woman did not have time to keep up with them. She stated that she had used every pan in the house and had even had to take food out of the ice box to make room for the ice cubes; that was *one* trouble she did not have with her old ice box.

A Sales Manager's viewpoint on home service was presented by C. B. Wilson of the Arkansas Louisiana Gas Company of Little Rock. His plea was for a larger number of home service workers in gas company departments in order to give more effective service to customers as a means of combating competition. Mr. Wilson stated that in a survey he had made of the electric companies in the same area, they were employing from five to ten more contact employees than were the gas companies. These contact employees included home service people along with salesmen and service men.

A surprise feature of the Breakfast program was the introduction at the close of little Barbara Jenkins who was described as the "probable Home Service Girl of Tomorrow" by Jessie McQueen of the American Gas Association, who presided as Chairman of the Home Service Breakfast program.

Home Service Conference

A Home Service Conference and Training Course will be held at the A.G.A. Testing Laboratory, Cleveland, O., June 15, 16, 17, 18. The course is sponsored by Elizabeth Sweeney of the Empire Gas & Electric Co., Geneva, N. Y., Chairman of the Home Service Committee.

The subjects included in the four day program cover a wide variety of activities, and the speakers chosen are eminently qualified. Conference headquarters will be at the Carter Hotel, Cleveland, O.

Refrigeration Campaign in New England

Announcement of a three-months campaign on gas refrigeration in New England was made at a recent sales meeting in Boston held under the auspices of the New England Gas Association. Newspapers, magazines and radio are to be used in this new campaign.

The Kansas City Exhibits

By

W. T. Rasch

Pres. Assn. of Appliance & Equipment Mnfrs.
and American Gas Products Corp.

W. T. RASCH

The Kansas City Convention from the viewpoint of the manufacturer was probably of more value generally than most conventions which have been held in recent years by the American Gas Association.

While the exhibition hall was not quite as well suited for exhibitions as the auditorium in Atlantic City, the attendance and real interest shown by utilities and jobbers was excellent.

MERRILL N. DAVIS
Vice President

The Association of Gas Appliance and Equipment Manufacturers, who conducted the exhibition, are to be highly congratulated on the arrangements and also the manufacturers for their very splendid booths. It was seldom during the entire week that the various manufacturers' booths were not well filled with delegates to the convention. As a matter of fact, one of the observations made by many utility men was to the effect that the meetings were not so well attended, but that the exhibition floor was always crowded.

We appreciate greatly as manufacturers the support given us by utility members and by dealers. It has encouraged us greatly. We hope, therefore, to be in a position as an association to render the same service at some future time to the Natural Gas Department of the American Gas Association. Manufacturers go to a considerable amount of expense in order to make their booths attractive and display the latest and best appliances for the express purpose of acquainting the gas

industry with what is new in gas appliances and equipment. When this is not appreciated by the industry the manufacturers feel that their time, effort, and money has been wasted.

No one could possibly have gone through and carefully investigated the appliances on display without feeling that his time had been worth while spent and that considerable progress is being made in design, construction, and efficiency of gas appliances and equipment.

The equipment manufacturers were well represented and, from the information I have obtained from those who displayed, were highly satisfied as to their efforts.

A.G.A.E.M. Hold Meeting

The Manufacturers held their meeting Sunday afternoon, May 9th. President William T. Rasch, introduced by Merrill N. Davis, chairman of the Exhibition Committee, reviewed the progress of the Association, and appealed for a better understanding of mutual problems affecting the manufacturers, the utility, the dealer and the consumer.

General View of Exhibit Hall from Balcony

DONALD McDONALD
Treasurer

President Herman Russell, A.G.A., urged aggressive promotion of gas to bring the facts home to the consumer. He quoted statistics on consumer preference for gas and electric service from a survey made by his company at Rochester, N. Y., which showed that many choices are made without knowledge of their relative advantages and cost.

Hugh H. Cuthrell, V.P., in Charge of Sales, The Brooklyn Union Gas Company, Brooklyn, N. Y., stated:

"We in the utility business need your cooperation and that of our retail dealers. Our problem is a joint one, and we should solve the gas appliance distribution problem jointly. You can do it by creating customer demand for your appliances while the utility is creating a demand for gas service.

C. W. BERGHORN
Secretary

Golden Faucet Gas Water Heater Contest Exhibit

This dramatic and colorful display of the Golden Faucet Contest for the sale of automatic gas water heaters constituted one of the high points of interest at the recent AGAEM Exhibition and AGA Natural Gas Convention. Although final results cannot be tabulated until the contest closes September thirtieth, it already has proved to be the most successful automatic gas water heater contest ever conducted. With almost $18,000 in cash awards at stake, more than 550 gas companies, representing about 90% of the meters in the United States, are enrolled in the gas company division of the contest. And several thousand retail dealers are competing for the merchandise prizes valued at $12,000 in the plumber division of the contest. Meanwhile sales of automatic gas water heaters are soaring and both gas companies and retail water heater dealers are sharing in the increased profits which their participation in the Golden Faucet Contest has helped to open up.

Gas Hydrates in Natural Gas Pipe Lines[a]

By

W. M. Deaton[b] and E. M. Frost[c]

U. S. Bureau of Mines,
Amarillo, Texas

THE Petroleum and Natural Gas Division of the United States Bureau of Mines is studying gas hydrates and their relation to the operation of natural gas pipe lines. The Natural Gas Department of the American Gas Association is cooperating with the Bureau in this work. The study is by no means complete, but some of the findings to date are being presented with the thought that they may be of immediate use to the industry.

Interest in this problem is widespread because the freezing of natural gas pipe lines is not confined to areas of extremely low winter temperatures, but is experienced everywhere that gas is transported under high pressure. The reason for the common occurrence of pipe-line freezing is that natural gas under pressure will combine with water to form solid compounds that resemble ordinary ice but remain solid at temperatures much higher than the normal ice point of 32° F. As many cities and towns with large numbers of domestic patrons are served with natural gas from remote fields, it is imperative that the flow of gas through transmission lines be uninterrupted. Failure of a pipe line to deliver gas for any reason whatever is a condition that cannot be tolerated long.

The general program of the Bureau's study is divided into four phases, as follows:

1. Review of the literature.
2. Field study of the problem.
3. Laboratory investigation of the physical and chemical properties of gas hydrates.
4. Study of methods suitable for preventing or relieving freeze-ups in natural gas pipe lines. Progress has been made on each of these phases.

Review of the Literature

Little material regarding gas hydrates has been published. The most outstanding contribution is that of Hammerschmidt, ([1, 2])[d] who presented a paper on gas hydrates at the meeting of the Natural Gas Department, American Gas Association, in May, 1936. Investigations of gas hydrates were reported by Villard[3] as early as 1888 and by De Forcrand[4] in 1902. Since that time a few articles on gas hydrates have been published, most of them dealing with gasses not commonly found in natural gas. Freezing in gas pipe lines at temperatures above 32° F. was referred to by Johnson and Berwald of the Bureau of Mines in 1935[5] and a paper discussing gas hydrates and their relation to pipeline operation was presented by one of the writers[6] at the Southwestern Gas Measurement Short Course at Norman, Oklahoma, in April, 1936. A discussion of gas hydrates appears in the Chemical Committee Report[7] of the American Gas Association for 1936.

Field Study

Pipe-Line Temperature Survey

Considerable progress has been made in the field study, particularly in the temperature survey which has been under way since January, 1936. As mentioned, gas under pressure in association with water will form hydrates at temperatures considerably above 32° F.; in general, the higher the pressure the higher the temperature at which hydrates will form. To determine the possibility of hydrate formation in a pipe line, it is necessary to know both the temperature and pressure of the gas; one is as important as the other. The pressure is easily determined and is usually available from the records of operation, but the temperature of the gas in the pipe line is seldom known. In the Bureau's contact with the industry, it has been observed that usually little information about the temperature prevailing in pipe lines is available. To supply this information, a temperature survey of a representative pipe line was undertaken.

The management of the Amarillo-Denver pipe line, operated in Texas by the Canadian River Gas Co. and in New Mexico and Colorado by the Colorado Interstate Gas Co., offered to cooperate in conducting such a survey. This pipe line system was chosen for study because of its proximity to the Bureau of Mines Laboratory at Amarillo, where the hydrate investigations are being carried on.

The Amarillo-Denver pipe line starts at the Bivins compressor station, about 35 miles northwest of Amarillo, Tex., and extends 340 pipe line miles to Denver, Colo. From Bivins to Pueblo, Colo., it is 22 inches in diameter and from Pueblo to Denver 20 inches in diameter. The gas delivered through this line is gathered from the Texas Panhandle gas field, principally from Moore and Potter Counties. After compression at the Bivins station the gas passes through an oil-absorption gasoline plant and enters the pipe line at a pressure of 300 to 350 pounds per square inch. When it leaves the absorbers, the gas is saturated with water vapor at a temperature of 75 to 90° F. The load on this pipe line ranges from 25 to 85 million cubic feet per day.

In making the temperature survey the Bureau established a number of temperature - measurement stations along the line at selected points as far north as Colorado Springs, Colo., about 270 pipe line miles from the Bivins end of the line. To determine where the gas leaving the compressor station attains ground temperature, stations for measuring the temperature were established at each of the main-line gate valves between the Bivins compressor station and Dal-

---

Presented at the Convention of Natural Gas Department of American Gas Association, Kansas City, Mo., May 10-15, 1937.

[a] *Published by permission of the Director, U. S. Bureau of Mines. (Not subject to copyright.)*

[b] *Chemist, U. S. Bureau of Mines, Petroleum and Natural-Gas Division, Amarillo, Texas.*

[c] *Associate Chemist, U. S. Bureau of Mines, Petroleum and Natural-Gas Division, Amarillo, Texas.*

[d] *The numbers refer to the references at the end of the paper.*

hart, Tex., a distance of 42 miles. These valves are approximately 10 miles apart. One additional station was established at a point 5 miles downstream from Bivins station. Temperature measurements at these stations were made with thermocouples. Figure 1 shows that in this pipe line the gas attains ground temperature about 30 miles from the compressor station.

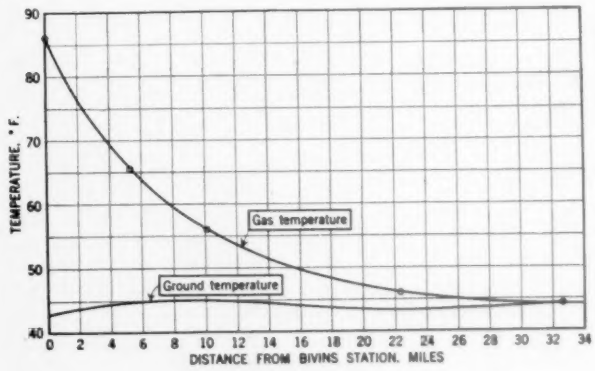


Figure 1. Temperature along pipeline downstream from Bivin's compressor station.

Several thermocouples were installed at the temperature station 5 miles downstream from the Bivins compressor station to determine how far from the pipe the ground temperature was affected by the warm gas in the line at this point. The thermocouples were placed in the ground at the depth of the center of the pipe, which at this location was 50 inches. One thermocouple was attached to the pipe and the others were placed at distances of ½, 1, 1½, 3, 6, and 12 feet from the pipe. Figure 2 shows the distribution of temperature determined by tests at this location.

In addition to the thermocouple installations, 14 recording thermometer stations were established along the pipe line between Bivins and Colorado Springs. At some of these stations temperatures at several depths were recorded through the use of multiple-pen or a number of single-pen instruments. In making measurements of the gas temperature, a separable thermometer well was placed in the pipe line, which allowed the thermometer bulb to project about 6 inches into the gas stream. Recording thermometers, fully compensated for ambient temperature effects, were used at the more important installations to give an accuracy of plus or minus one-half degree. Where thermometers with uncompensated tubing were used it was necessary to make adjustments from time to time to avoid errors of one degree or more.

To observe the variation of underground temperature with changes in atmospheric temperature, a number of recording thermometers were installed at each of several stations. Figure 3 shows, over a period of nearly a year, the variation of gas temperature and the average daily atmospheric temperature for an installation in an area known as the Black Forest, about 15 miles northeast of Colorado Springs. At this station the center of the pipe is at a depth of 47 inches. The average atmospheric temperature used in Figure 3 is the average of readings at 8 A.M., 3 P.M., and 12 midnight, which was found to agree closely with the average of hourly readings. It will be noted that even though the air temperature varied greatly, the gas temperature remained relatively uniform, changing slowly with the season. The underground temperature at the depth of the center of the pipe line also was recorded at this station, but it agreed so closely with the temperature of the gas that it is not shown as a separate curve. The difference between ground and gas temperature at this point was not more than 1° at any time during the year. This same conformity of gas temperature and ground temperature at the depth of the center of the pipe line was observed at the other temperature-measuring stations where the gas temperature was not influenced unduly by compressor stations, river crossings, or abrupt changes in pipe line cover.

In addition to the three temperature records mentioned above, ground temperatures at depths of 6 to 18 inches also were recorded at this Black Forest station. Figure 4 shows the variations of underground and atmospheric temperatures on an enlarged time scale. It will be noted that changes in the gas temperature lagged 3 to 5 days behind the corresponding changes in atmospheric temperature and that daily fluctuations in the gas temperature are entirely absent. This lag is typical of observations made at other points along the line. The time lag in the response of underground temperatures to changes in atmospheric temperature should be emphasized; although it is commonly recognized that a lag exists, its magnitude frequently is poorly "guessed at."

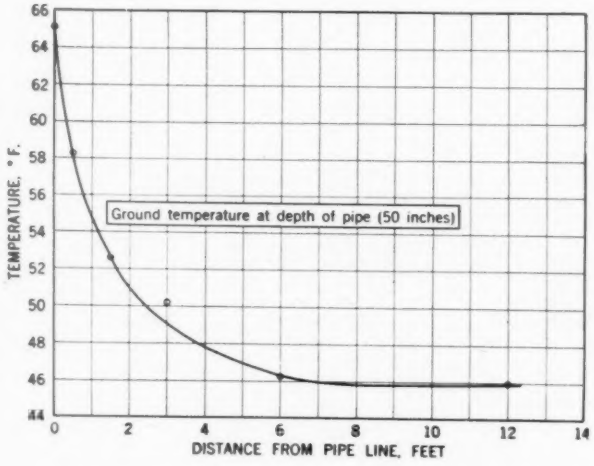


Figure 2. Distribution of underground temperature at right angles to pipe 5 miles downstream from Bivin's compressor station.

At the Arkansas River crossing

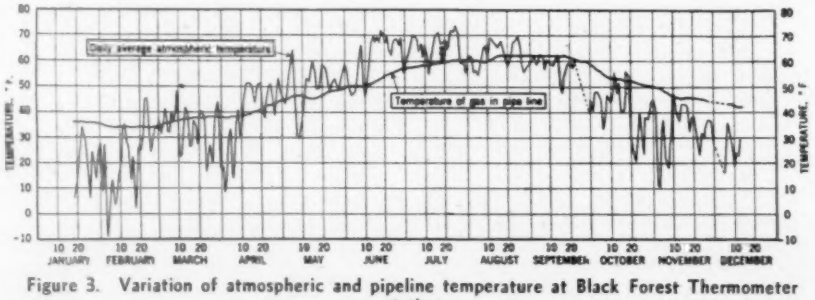


Figure 3. Variation of atmospheric and pipeline temperature at Black Forest Thermometer station

near Pueblo, recording thermometers were installed in the pipe line on either side of the river. Here the 22-inch line divides into six 10-inch, 900-foot runs laid on the river bottom. The normal change in gas temperature in crossing the river is about 2° F. throughout the year. The results of a test made in February, 1937, may be of interest. At the time of this test the river water was at 32° F. and was flowing full of ice.

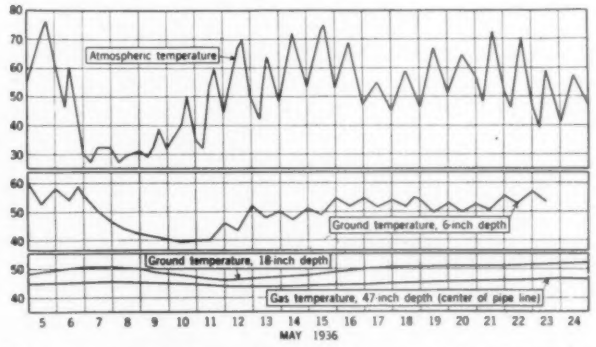

Atmospheric temperature
Ground temperature, 6-inch depth
Ground temperature, 18-inch depth
Gas temperature, 47-inch depth (center of pipe line)
MAY 1936

Figure 4. Atmospheric, ground, and gas temperature at Black Forest thermometer station

The gas temperature dropped from 42 to 40° F. The gas flow was 42 million cubic feet per day and the line pressure at this point was 152 pounds per square inch.

This temperature survey shows that the gas temperature at any given location is relatively uniform. It changes slowly with the season but does not respond appreciably to temporary weather changes. Unless affected by compressor stations or other disturbing influences, the gas temperature is essentially the same as ground temperature at the depth of the center of the pipe line; hence, it is affected by the depth to which the line is laid. The gas temperature varies along the line in accordance with the seasonal atmospheric temperature of the region traversed. Whether the pipe line temperatures are influenced greatly by the moisture content of the soil has not yet been determined in these tests. It may be expected, however, that regardless of any change in moisture content of the soil, the underground and the pipe line temperatures will respond alike and continue to maintain equality.

As the formation of gas hydrates is influenced by both temperature and pressure, the need for reliable pipe line temperature information is apparent. Thermometers placed at intervals of 30 to 40 miles along a line are desirable. In conducting this temperature survey, it was found that the temperatures of the gas measured in thermometer wells placed in the line and temperatures of the pipe registered by thermocouples in contact with the pipe line agreed within the precision of measurement, about ½° F.; hence, any method by which the temperature of the pipe can be measured will be satisfactory. The gas temperature can be estimated with reasonable accuracy by measuring the ground temperature at a depth corresponding to the center of the pipe line. In some cases this may be easier than measuring the temperature of the pipe or the gas directly.

In measuring underground temperatures the Bureau has used thermocouples mounted on wood staffs. A 1½ inch diameter earth auger was used to drill a hole to the desired depth. The thermocouple staff was then placed in the hole and the temperature read after enough time was allowed for temperature equilibrium to become established. In later tests a mercury - in - glass thermomter mounted on the lower end of a staff was used, precaution being taken to read the thermometer quickly after withdrawal from the hole. With proper precaution this provides an inexpensive and convenient means of ascertaining underground temperatures.

Laboratory Data

In conducting the laboratory investigations of gas hydrates, methods and equipment were chosen which would give results directly comparable with the formation of hydrates in pipe lines without sacrificing precision and accuracy. Equipment of other design was used in certain preliminary phases of the work, but the results here reported were obtained with the apparatus illustrated in Figure 5 and described below.

The main body of the apparatus consists of a glass-windowed high-pressure cell having internal dimensions of 1 by 1¼ by 6 inches. The unit is made from a Jerguson, type P, high-pressure, liquid-level gage. The windows in the gage are plate glass, approximately ¾ inch thick, suitable for withstanding high pressure. The apparatus used in this investigation withstood a hydrostatic-pressure test of 2,500 pounds per square inch. This type of cell was considered to be better than one of high-pressure glass tubing, because the plate-glass windows permit the interior to be observed without distortion. Flow of gas through the apparatus is controlled by suitable valves. The cell can be oscillated about a horizontal axis, but usually it is operated in an approximately horizontal position. Connections in both the bottom and the top controlled by suitable valves allow the gas to be bubbled up through water in the cell or to flow across the surface of the water as desired.

The cell is placed in a thermostated bath equipped with plate-glass windows and a suitable lighting system for visual observation. The temperature of the bath is controlled to plus or minus 0.05° F., and temperatures in the bath and cell are measured to the same accuracy by thermocouples and a high-sensitivity potentiometer. To measure temperatures within the cell, three thermocouples are placed inside—one junction at the bottom and normally in the water, the second in the middle in contact with the water surface, and the third in the gas space in the upper part of the cell. A fourth thermocouple is placed in the bath to determine its temperature, permitting convenient comparison of temperatures within the cell and the bath.

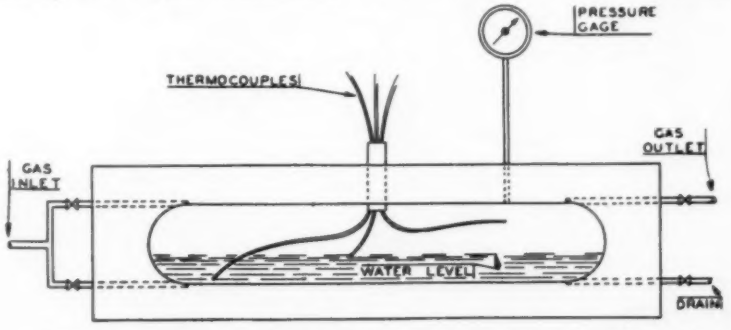


Figure 5. Apparatus for laboratory study of gas hydrates; glass-windowed high-pressure cell

Confirming Hammerschmidt's (1, 2) results, the writers have found that until crystallization has been started it sometimes is difficult to get the hydrates to form even at pressures 300 or 400 pounds per square inch in excess of that at which they will form when crystals are present. Although this behavior has been demonstrated repeatedly, it probably offers no advantage in the operation of pipe lines because the phenomenon is transitory and there is no assurance that the liquid in the line will not become inoculated in time with hydrate. When this occurs, hydrates will form at pressures only slightly higher than those at which they decompose.

A dynamic method is used for determining curves of hydrate decomposition like those shown in Figure 6. At a selected bath temperature the apparatus, containing gas under pressure and some liquid water, is manipulated to form crystals of hydrate. This usually is accomplished by reducing the pressure within the cell rapidly, thus producing local cooling. After hydrate crystals are observed to be present, the pressure in the apparatus is maintained for a time at a value estimated or known to be higher than the decomposition pressure for the selected temperature. Gas is allowed to flow through the apparatus across the surface of the water until the water freezes over with hydrate. The pressure regulator used to control the pressure in the cell then is manipulated to reduce the pressure slowly. After a trial or two, the decomposition pressure can be estimated within a few pounds; and a careful check is made in this range of pressure. By having only a thin film of hydrate ice on the water surface, it is possible to check the pressure at which the hydrate decomposes within 1 or 2 pounds per square inch.

The depressuring method of determining the hydrate-decomposition curves has been checked by the alternate method of holding the pressure constant and raising the temperature of the bath. Data obtained by this method conform to those obtained by dropping the gas pressure at constant temperature. As reduction in pressure is more readily accomplished, the depressuring method generally is used.

Figure 6 shows hydrate-decomposition curves for ethane, propane and two natural gases. In addition, Hammerschmidt's (1, 2) curve for another natural gas is shown for comparison. It will be observed that each natural gas has a distinctive curve. The analyses of the gases used in determining these several curves are shown in Table 1. The purity of the ethane and propane used was not very high, as the analyses show, and caution should be exercised in using the curves for these two gases. They are presented primarily to afford comparison with the hydrate curves of natural gases containing many components. More data must be obtained before spacing of the curves can be correlated definitely with gas composition.

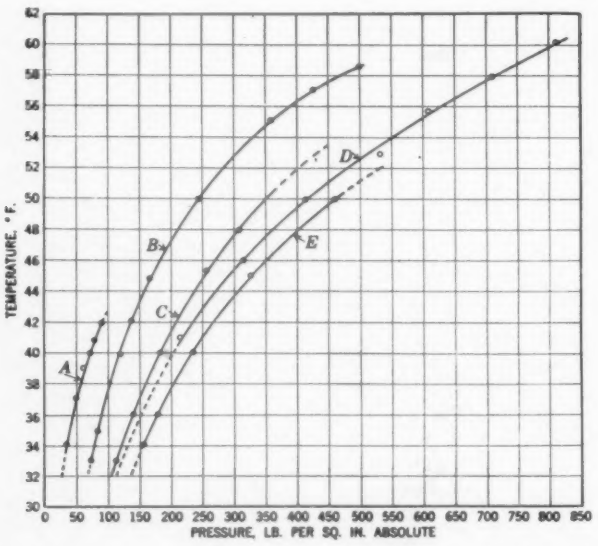


Figure 6. Curves for decomposition of gas hydrates: A, Propane (83.4 per cent pure); B, ethane (93.6 per cent pure); C, natural gas, Canadian River Gas Co.; D, natural gas, Hammerschmidt's curve; E, natural gas, Cliffside field.

In making the hydrate tests it has been observed that although most of the hydrate decomposes readily when the pressure in the cell is reduced at constant temperature, a small, indefinite amount of hydrate persists for a considerable time, even after the pressure is reduced to atmospheric. This hydrate which fails to decompose either is submerged in the water in the cell or completely covered by a water film. The temperature of the water, as indicated by the thermocouples within the cell, usually is not more than a few tenths of a degree lower than the bath temperature.

This hydrate persistence is mentioned as a matter of interest, but no conclusive explanation can be offered at this time. It may be comparable to the persistence of hydrate in pipe lines that have been fully depressured. It is to be noted, however, that so far as the writers have determined, hydrate removed from pipe lines has a temperature of 32° F. or lower, even though it is definitely known that the hydrate was formed in the line at considerably warmer temperatures. It seems likely that as the hydrate in the line starts to decompose it absorbs heat from itself, thus lowering its temperature; this reduction in temperature continues until the normal ice temperature is reached, at which time the water released by decomposition of the hydrate is frozen into water ice. This explanation would account for the relative stability of the hydrate mass at a pressure of 1 atmosphere. Further investigation of this phenomenon is contemplated.

In the laboratory experiments the hydrate is observed to accumulate on the surface of the water. As gas is passed over a water surface, hydrates form as a scum over the entire surface; then the formation ceases or at least proceeds very slowly. If the gas is bubbled through the water, the bubble surface is transformed into a film of hydrate. This observation suggests that the formation of hydrate is a surface reaction.

It is of considerable importance to know whether the hydrate reaction will take place in the gas phase. If the reaction is confined to water surfaces, this would not be possible. It is planned to investigate this question more thoroughly.

Remedial Measures

As water is necessary to the formation of gas hydrates, an obvious means of eliminating hydrate formation is to remove all water from the pipe line and then dry all gas that enters the line. If hydrates will form only where liquid water is present, it would be necessary only to dry the gas to a point where its dew point is lower than the temperature in the pipe line. This would not necessarily eliminate all danger of trouble from freezing in regula-

tors because the local cooling resulting from expansion may reduce the gas to a temperature lower than the dew point of the gas, thus condensing water and permitting hydrates to form.

Several gas companies are removing the water from the gas at their initial compressor stations. An absorption system using refrigerated calcium chloride brine commonly is used. In two recent installations diethylene glycol is employed. Glycerine has been used, but reports indicate that some difficulty was encountered due to decomposition or oxidation of the glycerine to a less hygroscopic material.

In systems using a liquid for absorption of water vapor the solution is circulated over a bubble tower through which the gas passes. The solution is regenerated by diverting a part of the circulating liquid to an evaporator where it is concentrated and then is reintroduced into the cycle; or as in the case of diethylene glycol, the entire circulating solution is passed through a still where the water is removed by distillation.

Other processes of removing water from gases employ silica gel, activated alumina, and charcoal. These are adsorptive materials and tend to remove gasoline vapors as well as water vapor. As the adsorptive materials must be regenerated at intervals, processes using them are intermittent, and it is necessary to have multiple-unit installations so some units can be used for adsorption while others are being regenerated.

Many gas-transmission lines are operated without removing water from the gas, except by condensation in the pipe line. Such lines are confronted with the possibility that hydrates will accumulate in the line if the temperature and pressure are conducive to their formation. When freezing occurs, it is necessary to employ some means for relieving the freeze-up. A number of methods are in common use. As the formation of hydrates is similar to the freezing of ice, some means of heating the line naturally suggests itself. To do this, the line is uncovered and heat applied. Sometimes fires are built in the trench using combustible materials that are readily available. This method is effective if the freeze can be located exactly and the heat applied at the point of freezing. Frequently, however, the freeze-up is so complete that only a small flow of gas is maintained; hence, a relatively small amount of heat is carried to the point of plugging.

Another method commonly used is to put alcohol into the line with the hope that it will be carried to the point of plugging where it will decompose the hydrate. This method also requires that the plug be located fairly exactly and depends upon a sufficient gas flow to carry the alcohol to the plug. A third method is to lower the pressure in the section of line which contains the freeze-up. During the reduction in pressure the hydrate decomposes, at least partly, so the plug is broken. Although all these methods are effective to some extent, the depressuring method seems to offer the greatest promise of success where its use is practicable and the temperature of the pipe line is above 32° F.

The depressuring method was tried with excellent results following a freeze-up in January, 1936, in the Colorado Springs 8-inch lateral off the Amarillo-Denver line. In this case, the pressure in the lateral was lowered by closing the gate at the main line and allowing the city demand to reduce the pressure. As soon as the pressure in the lateral reached 100 pounds per square inch, the lateral gate at the main line was partly opened and manually operated to keep the pressure from dropping further. The line was operated under these conditions for a period of about 48 hours. Full pressure then was restored to the line. Upon resumption of normal operation, the plug was observed to be entirely gone; in fact, the pressure-drop record between the main line and the city-border station showed that the plug had been relieved considerably by the time the pressure reached 125 pounds per square inch. The exact temperature in the lateral was not known, but it was estimated to be about 37° F. Referring to the curve for the Canadian River gas, which supplies this line (Figure 6), it will be observed that at 37° decomposition takes place at a pressure of 150 pounds per square inch absolute; and the decomposition of the plug at 125 pounds per square inch gage would be expected.

In February, 1937, a freeze-up of the 20-inch main line occurred at a point closer to the Bureau's thermometer station in the Black Forest. The line was almost completely plugged with hydrates. Attempts were made to heat the line and to lubricate alcohol into the line to relieve the plug without a great deal of success, because the exact location of the freeze-up could not be determined and the flow of gas through the line was reduced greatly by the plug. Depressuring of that section of the line then was resorted to, with the result that when the gas was turned into the line again the hydrate had decomposed enough to allow resumption of normal gas flow. Following the resumption of service, the drips along the line were blown and an estimated total of 1,300 gallons of water was removed. The gas pressure at this point normally is from 200 to 250 pounds per square inch. The temperature of the gas in this region as registered by the recording thermometer which the Bureau has installed there was 38° F. Referring to the hydrate curve for this gas, it is observed that at this temperature hydrates will not decompose until the pressure is reduced to 160 pounds per square inch.

Although the Bureau's study is far from complete and many questions are yet to be investigated, the information collected seems to justify a few suggestions regarding operating methods to avoid freeze-ups due to hydrate formation. These are enumerated below:

1. Where feasible and economically practicable, remove water from the gas to a point where it will not condense in the pipe line.

(Continued on page 32)

TABLE 1

ANALYSES OF GASES USED IN OBTAINING CURVE OF FIG. 6

Constituent	*Ethane* *A*	*Propane* *B*	*Natural Gases* *C*	*D*	*E*
			Per Cent by Volume		
CO_2			0.2	0.2	0.8
N_2 Residue			14.3	7.19	25.0
CH_4	2.6	4.22	75.16	82.50	67.4
C_2H_6	93.6	12.41	5.95	5.99	3.7
C_2H_4	3.8				
C_3H_8		83.37	3.33	3.26	1.9
C_4H_{10} (iso)				.30	
C_4H_{10} (normal)			1.06	.49	1.2
C_5H_{10}+				.07	
Total	100.0	100.0	100.00	100.00	100.0

The Use of Anhydrous Ammonia to Inhibit Gas Hydrate Formation

By

J. T. Russell

Panhandle Eastern Pipe Line Company,
Liberal, Kansas

IT has been shown that the primary factors responsible for the formation of natural gas hydrates are pressure, temperature, and the composition of the gas[5]. Since gas pressures and temperatures are dictated by circumstances, the only means available to the gas industry of avoiding line obstructions caused by these compounds lies in changing the composition of the gas stream. This may be done by either removing certain constituents or by adding others.

In practice the composition of the gas stream is changed by removing water vapor, and a number of plants for dehumidifying, or dehydrating, natural gas are now in operation. Inherently, plants for extracting water vapor are applicable only to large volumes of gas, and in most cases this has limited the application of dehydration to main lines, the gathering systems supplying these lines remaining unprotected.

Insofar as changing the composition of the gas by addition is concerned, alcohol seems to be the only constituent used generally. These injections have been mostly for the removal of hydrate obstructions. In the few cases that alcohol has been injected to prevent the formation of gas hydrates, the amount required has been found to be such that the cost is prohibitive.

The problem of preventing the formation of gas hydrate obstruction has not, therefore, been wholly solved for the gas industry, because no method has thus far been developed which is versatile and economical enough to be applied to field gathering systems, individual laterals, etc. To meet the specification of versatility, such a method will of necessity depend on changing the composition of the gas stream by the addition, rather than the extraction, of constituents. This paper describes the work which has thus far been done in using anhydrous ammonia as an additional constituent in the gas stream to prevent the formation of gas hydrate.

Paper presented at the Natural Gas Department Convention of American Gas Assn., Kansas City, Mo., May 10 to 14, 1937.

Unfortunately the information regarding ammonia is far from complete. Particularly is this true in the matter of the minimum concentration required to inhibit hydrate formation in natural gases of various compositions, and in the matter of ammonia injection apparatus. It is hoped, however, that by presenting the information available to date, the use of ammonia in gas transmission lines may become more universal, and progress in knowledge concerning its use may be more rapid.

Development

After a series of laboratory experiments in which gas hydrates were formed in a glass tube at full line pressure, it was ascertained that the minimum concentration of ammonia effective for preventing the formation of these compounds was .0042% by volume, or 42 parts per million (p.p.m.). The natural gas used in these experiments came from the Panhandle field and contained 0.2% carbon dioxide. A pressure of 430 pounds per square inch gauge obtained during the experiments and a gas temperature of 40° F. was used to induce gas hydrate formation. It is significant that the minimum concentration found in these experiments corresponds to a partial pressure of ammonia which should exist for the formation of ammonium bicarbonate[6]. Moreover, carbonates were detected in the fluid resulting from the decomposition of the gas hydrates. This seems to indicate that ammonia owes its effectiveness as an inhibitor of gas formation to the fact that it combines with water to form a solution of ammonium hydroxide and ammonium carbonates. During these experiments it was also determined that water in contact with gas containing the minimum concentration would dissolve ammonia from the gas until a solution containing 4.702% ammonia by weight was obtained.

Another series of experiments, lasting 72 days, indicated that with the particular gas used, the injection of ammonia would result in no damage to copper-bearing alloys used in transmission lines, such as brass valve seats, bronze valves, etc. Still another series of experiments indicated that concentrations of ammonia of 130 p.p.m., or even higher, might be used without resulting in the formation of solid ammonium salts by the reaction of water, carbon dioxide, and ammonia. The practical significance of this is if ammonia were injected into a transmission line in amounts sufficient to prevent gas hydrate formation, there would be no danger of stopping the line with plugs of solid ammonium salts.

The indications of the laboratory experiments were subsequently checked by tests in the field under actual operating conditions. A well line in which gas hydrates could be formed at will by turning out the throttle valve heater was used in these experiments. Figure 1 indicates the ease with which gas hydrates could be formed and also the ease with which ammonia affected their decomposition. Liquid ammonia was injected by means of a gravity cylinder, a shielded sight glass being used to indicate the rate of flow. Figures 2 and 3, which are photostats of charts from the orifice meter on this line, indicate that 42 p.p.m. is the minimum concentration effective for inhibiting the formation of gas hydrates—this being the minimum concentration capable of maintaining normal flow in the line. The simultaneous variations of both static and differential readings shown on these charts

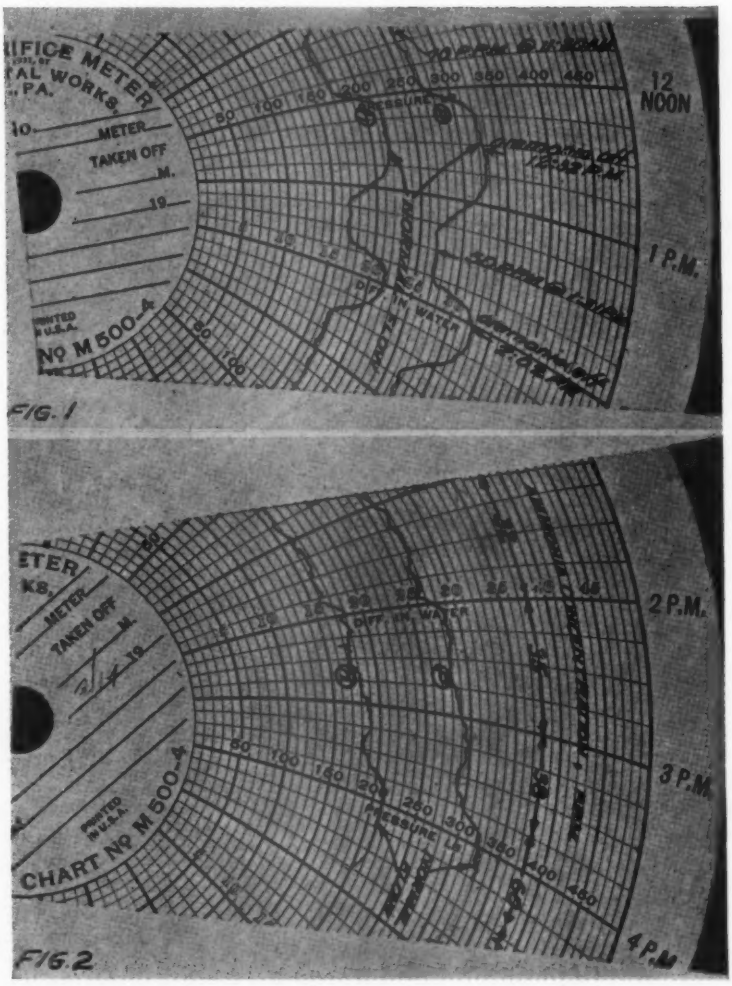


FIG. 1

FIG. 2

were caused by the gas being blown into the air on the down stream side of the meter through a critical-flow prover orifice.

The field work also included experiments in which previously formed gas hydrate obstructions were removed by injecting liquid anhydrous ammonia. Injection of ammonia from commercial cylinders was accomplished by means of a hand-operated pump, presently to be described in the section on injection apparatus. The two following cases illustrate the use of ammonia to remove gas hydrate obstructions.

The first case illustrates the use of ammonia to remove what is called a "dead freeze"—a situation in which the hydrate obstruction has completely arrested gas flow. So formidable was this obstruction that it could not be decomposed by removing the pressure on the down stream side and allowing full well pressure (app. 400 lbs. per sq. in. gauge) to act on the other side. To remove the obstruction, the line pressure was reduced to atmospheric on both sides, and approximately seven lbs. of liquid ammonia was injected on the well side. Full well pressure was then applied to force the ammonia into contact with the obstruction. Removal of the obstruction occurred approximately 40 minutes after the injection of ammonia.

The second case illustrates the use of ammonia to remove hydrate obstructions which were slowly forming throughout a considerable length of large-diameter transmission line. In this case, the obstructions were increasing in size so slowly that their location by means of daily pressure drops along the line was impossible. The presence of obstructions was readily observed, however, in the steady decrease in the volume of gas which could be delivered through the line with constant terminal pressures. By injecting enough ammonia to maintain a concentration of 130 p.p.m. at the point of injection for 90 hours, the hydrate obstructions were completely removed, as evidenced by line deliveries again becoming normal.

Figure 4 presents the variation of pressure, drip fluid, and volumes delivered before and after the ammonia injection. It is significant that drip fluid decreased as volume decreased, presumably because the condensed water was being converted into gas hydrates. The trend of the volume curve in Figure 4 indicates that gas hydrate obstructions may form very slowly in some cases, and unless accurate delivery records are kept the presence of these in large transmission lines may go unobserved.

Incidentally, the concentration of ammonia in the gas stream was determined at the siphon drip where the greatest increase in drip fluid was noted, and this turned out to be 43 p.p.m. Presumably the increased volume of drip fluid was obtained from water previously combined as

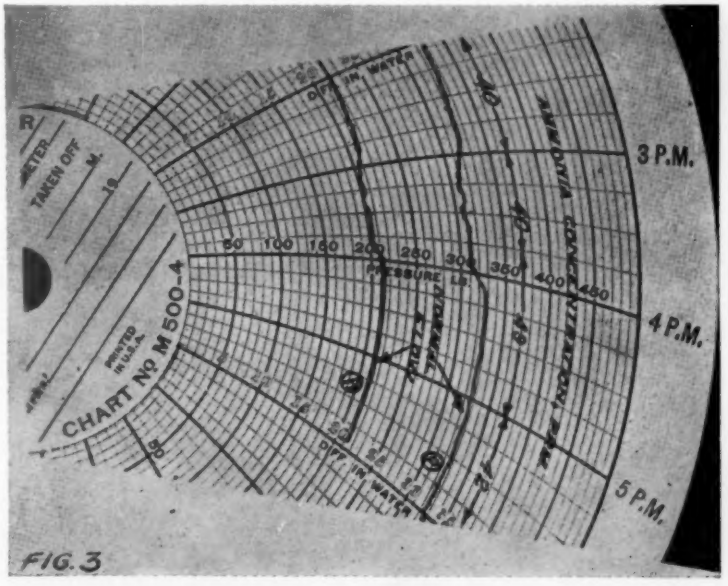


FIG. 3

gas hydrates, and the 43 p.p.m. of ammonia was sufficient to decompose these. Since both the laboratory and the field experiments indicated that 42 p.p.m. was required to inhibit gas hydrate formation, this result indicates that the concentration required to prevent formation is essentially the same as the concentration required to effect decomposition.

The field work, in both the inhibiting of gas hydrate formation and the decomposition of previously formed hydrate obstruction confirmed the findings in the laboratory in that no solid ammonium salts were formed which might obstruct flow, and that the injected ammonia did not attack any brass valve seats, or other brass or bronze fittings in the lines, nor have any detectable action on test specimens of bronze and brass placed in a drip receiving fluid condensed from the ammonia-natural gas mixture.

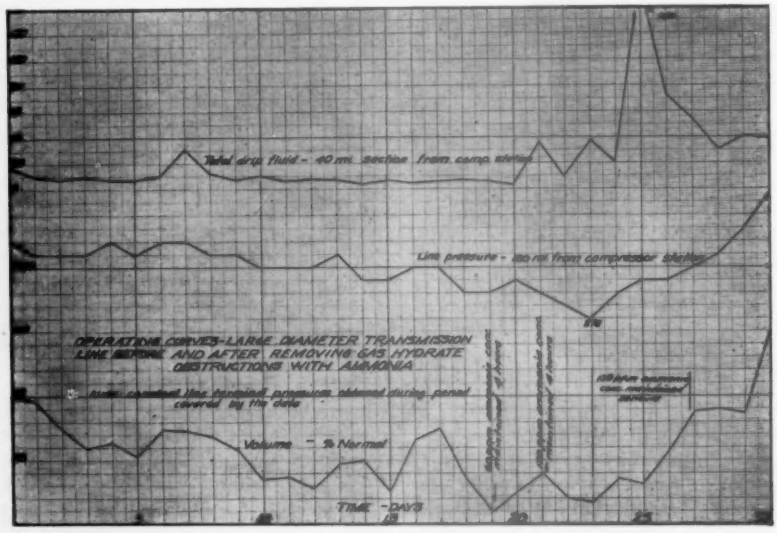

Total drip fluid - 40 mi. section from comp. station
Line pressure - 180 mi from compressor station
OPERATIONS CURVES-LARGE DIAMETER TRANSMISSION LINE BEFORE AND AFTER REMOVING GAS HYDRATE OBSTRUCTIONS WITH AMMONIA
Volume - % Normal
TIME - DAYS

Figure 4

A significant observation while using ammonia to decompose gas hydrates was that these apparently liquefy in place, while with alcohol such obstructions many times move down the line without liquefying, sometimes being removed in drips and sometimes lodging in a low sag in the line to start another obstruction. A case in which alcohol was injected came to the author's notice some years ago. The hydrate obstruction was moved from one line sag to another for a period of about 10 days without effecting its removal.

Ammonia Injection Apparatus

The development of satisfactory apparatus to effect the injection of ammonia into high-pressure natural gas lines was another phase of the field investigation. Two types of injection apparatus were designed, one to continually inject ammonia for preventing the formation of gas hydrates, the other to inject ammonia for clearing lines of previously formed hydrate obstructions.

The type of injector found most satisfactory for continuous service is shown diagramatically in Figure 5.

With a given size orifice, the concentration of ammonia in the line will vary with both the reservoir temperature and pressure. Except in unusual cases, the variation in pressure of high pressure lines will not affect the concentration of ammonia by amounts greater than can be tolerated in practical cases. The variation in reservoir temperature will, however, affect the performance of the injector noticeably—an increase of a few degrees serving to cause a pronounced increase in the concentration maintained in the pipe line. For example, an increase in temperature from 36° F. to 50° F. would, theoretically, increase the concentration of ammonia in the pipe line from 31.6 to 42 p.p.m. In order to minimize the fluctuations caused by varying temperatures, the reservoir is buried to at least line depth. Experience has shown that the daily variation in temperature at line depth does not exceed a very few degrees, and that seasonal variation of ground temperature occurs very gradually. In practice, therefore, the variation in reservoir temperature may be compensated for by using various size orifices for various temperature ranges—for example, from 50° to 45° F., 44° to 40° F.; 39° to 35° F. Of course, the injector could be adjusted to feed enough excess ammonia at 50° so that a concentration of 42 p.p.m.

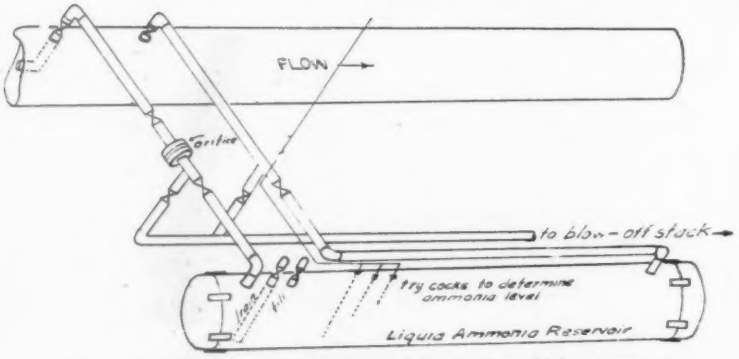


Figure 5. Apparatus for continuous injection into high-pressure gas transmission lines.

Figure 6 shows an installation of an injector at a well head. As shown, this consists of a Pitot tube to utilize the dynamic head of the flowing gas to cause a certain portion to be by-passed over liquid ammonia contained in a reservoir adjacent to the pipe line. In passing through the reservoir, the gas becomes saturated with ammonia vapor and reenters the line through a tap at right angles to the flow. The desired concentration of ammonia in the gas stream is obtained by controlling the volume of by-passed gas by means of an orifice.

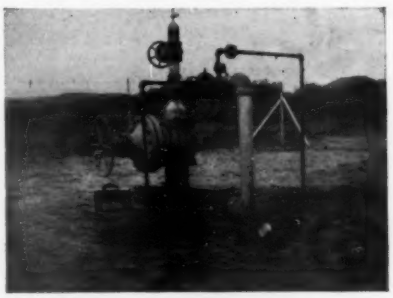


Figure 6

would be maintained when the temperature reached 35° F., if the cost of the excess ammonia did not warrant the use of an assortment of orifices, as in the case of small installations. Obviously, constant reservoir temperature could be maintained by means of a thermostatically controlled heater, but in the installations that have thus far been made, this was deemed an unwarranted refinement.

Theoretical considerations indicate that the combination of Pitot tube and orifice used in this apparatus should result in an injector which would, at constant pressure, maintain a constant concentration of ammonia in the line regardless of fluctuations in volume flowing. Furthermore, the velocity through the orifice should be very nearly the velocity in the line, so that the ratio of the volume of by-pass gas to volume of gas-flowing is the same as the ratio of cross sectional area of the by-pass orifice to the cross sectional area of the line. This fact, together with the use of Dalton's law for estimating the composition of the gaseous mixture in the reservoir, makes it possible to calculate the size orifice required to inject any given concentration of ammonia. The formula below is an expression of these facts:

$$a = \frac{N\,P\,A}{10^6 p}$$

In which a = cross sectional area of orifice, square inches
A = cross sectional area of line, square inches
P = line pressure, lbs. per sq. in. absolute
p = saturated vapor pressure of ammonia at the given reservoir temperature, lbs. per sq. in. abs.
N = Ammonia concentration in line, p.p.m.

In order to ascertain the correctness of the theoretical deductions, the concentration of ammonia in the gas on the outlet of the injector shown in Figure 6 was determined for various rates of flow. The results are summarized below:

Rate of Flow Million Cu. Ft./24 Hrs.	*Ammonia Concentration p.p.m.*
2	132
1	113
½	89

The line was of standard 4″ pipe, the pressure was 388 lbs./sq. in. absolute, the reservoir temperature was 40° F., and the by-pass orifice was 7/64″ in diameter. Substituting these data in the above formula it is found that the injector should have maintained a concentration of 139.5 p.p.m., which compares favorably with the 132 p.p.m. actually found. The data seem to indicate that for moderate fluctuations in rates of flow, the injector may be considered essentially self-adjusting and the theoretical formula may be used to calculate orifice sizes: but with greater fluctuations in flow the automatic features are partially lost and the orifice formula is no longer correct.

Although the injector shown in Figure 6 maintained a constant ammonia concentration in the gas stream over a test period of 17 hours, subsequent tests of an injector installed on a 22″ line have shown that the concentration in the gas stream decreases with time and with the lowering of the liquid ammonia in the reservoir. This decrease seems to be caused by failure of the reservoir gas to become saturated with ammonia vapor. Tests using towel baffling in the reservoir to assure better contact of ammonia and by-pass gas are now being conducted, but at the time this paper is written no results are available.

Figure 7

Although not so shown in Figure 6, all parts of the injector should be buried to line depth to avoid condensation of moisture in the lines. Because of the high concentration of ammonia in the reservoir gas, there is a danger of stopping the return line with solid ammonium salts if condensed water vapor is present.

Transfer of ammonia from commercial cylinders is accomplished by shutting the reservoir off from the line and reducing its pressure below that in the cylinders, and allowing the pressure differential to effect the transfer. A small volume of gas from the reservoir is continually blown to the air during the transfer to assure the pressure necessary for flow. A 150-pound commercial cylinder can be emptied in 25 minutes. In the case of large installations, it may be advisable to provide storage capacity and purchase ammonia in tank car lots, transferring from storage tank to reservoir as needed.

This type injector is obviously applicable only to lines whose pressures exceed the vapor pressure of liquid ammonia at ordinary temperatures.

For injecting small amounts of ammonia for removing gas hydrate obstructions, the apparatus illustrated in Figure 7 was found satisfactory. As shown, this consists of a small double-acting pump of ¾″ base and 3″ stroke mounted on a skid which accommodates a 100 lb. ammonia cylinder. The blow-off arrangement shown in the foreground is used to remove liquid ammonia from the pump and connections without hazard to the operator. At 40 strokes per minute, the discharge of a pump cylinder being considered a stroke, this apparatus will inject approximately 50 lbs. of liquid ammonia per hour. This weight when vaporized is equivalent to a little over 1,100 cu. ft. of ammonia vapor. These figures facilitate the calculation of a number of strokes per minute to use for any volume of flow.

Line Loss of Ammonia

The fluid condensed in a pipe line will of course remove a certain amount of ammonia from the gas stream. Laboratory experiments mentioned previously indicate that at equilibrium the drip fluid in contact with a gas containing 0.2% carbon dioxide and under 430 lbs./sq. in. gauge pressure would contain 4.702% ammonia by weight. This would seem to indicate that with great amounts of drip fluid, so much ammonia would be removed from the gas stream that injection at a number of points would be necessary in order to fully protect a line. The experience of one company has shown, however, that the hot gases leaving a compressor station travel a certain distance before being cooled to a temperature at which hydrate formation is possible. It was observed that hydrate obstruction never occurred closer than 25 miles downstream from the nearest compressor station and that in traveling this distance, the gas had rejected the major portion of its condensable vapors. Another company found

that gas hydrate obstructions formed at a distance of approximately 18 miles downstream from a gasoline plant. Based on these observations an ammonia injector for a 22″ line was installed at a point 19 miles from the compressor station in order to avoid excessive loss of ammonia. It was subsequently found that the ammonia content of the gas decreased from 32 to 29 p.p.m. in traveling a distance of 80 miles from the injector. Protection of the line was thus obtained without excessive loss of ammonia. It seems reasonable that for other lines a point for injection might be selected which would give protection against hydrate formation without necessitating the loss of ammonia in drip fluid which is above the critical temperature. In cases in which this procedure would not give the required line protection, injection before and after the section in which the major portion of the drip fluid is condensed would be necessary.

Even when injection is made at such a point that the ammonia-gas mixture must pass over all the condensed drip fluid the line-loss of ammonia is not as great as the laboratory result would indicate. A concentration of 130 p.p.m. in a main line was reduced to 43 p.p.m in traveling a distance of over 400 miles from the point of injection.

Economics of Continuous Ammonia Injection

The cost of continuous ammonia injection will vary directly with the unit cost of ammonia. This is determined by the quantity purchased—whether in cylinders or in tank cars. The present price (Feb., 1937) of ammonia in tank cars is 4½ cents per lb. and 15½ cents per pound in 100 lb. cylinders. Since 42 cubic feet of ammonia at 60° F.—14.9 lbs./sq. in. abs. weighs 1.933 pounds[3], one can calculate the cost of protection against gas hydrate formation is 8.7 cents per million cubic feet if the ammonia is purchased in tank cars, and 30.0 cents per million cubic feet, if it is purchased in cylinders.

It is obvious from the difference of these two figures that if continuous injection is contemplated on a large scale, the investment in storage equipment to permit the purchase of ammonia in tank car lots is justified.[1]

It has been estimated that the cost of dehydration ranges between 20 cents and 75 cents per million cubic feet, and a comparison of these figures with those above indicates that the cost of hydrate prevention using ammonia (tank car lots) is from 12 to 43% the cost of protection by dehydration.

Such a comparison is not entirely accurate, however, because the cost of blowing drips, which is avoided by dehydration, and the costs necessitated by operation, maintenance, and investment charges should be added to the cost of ammonia protection. This has been done in the case of an injector installed on a large-diameter transmission line, based on the following conditions: A flow of 100 million cubic feet per day, 5.3 cents per pound as the cost of ammonia delivered, 126 days as the period during which injection is necessary, and $35 per day as the cost of dehydration. The following annual costs resulted: $2,694 as the cost of ammonia injection and $12,775 as the cost of dehydration. The annual cost of ammonia injection was based on the following cost items:

Cost of injected ammonia ..	$1,289
Labor, blowing drips	660
Labor, operating injector ..	325
Depreciation, etc. (10% per year)	420
Total	$2,694

Restrictions on the Use of Ammonia

There are a number of restrictions on the injection of ammonia into natural gas transmission lines. That which follows is an attempt to rationalize these restrictions in the light of present experimental evidence and practical experience.

The injection of ammonia into gas which may be used for domestic purposes is restricted by law, most state laws specifying 5-10 grains of ammonia per 100 cubic feet as the maximum concentration allowable in domestic gas[2]. The concentration necessary for inhibiting the formation of gas hydrates (42 p.p.m.) is, however, only 1.336 grains per 100 cubic feet. It is apparent, therefore, that the legal restrictions in no way restrain the use of ammonia for preventing or decomposing hydrate formations in natural gas transmission lines.

The possibility that ammonia might corrode brass-trimmed pipe line fixtures is another restriction. It is common knowledge that ammonia will rapidly attack copper, brass and bronze in air, and this has led to the belief that ammonia in a transmission line would act similarly. Such a belief however, is not borne out by the facts.

For corrosion to proceed, it is necessary for both water and oxygen to be present[5]. The absence of water might prevent internal corrosion of transmission lines in a few cases, but the greatest limiting factor is the absence of oxygen in the gas stream.

The occurrence of oxygen in natural gas is still a matter of controversy. Small amounts of oxygen are usually shown in analyses of natural gas, but these are erroneously reported in many cases[4]. Burrell and Seibert, in the reference cited above, could not detect oxygen in the natural gas samples they examined, and the author has never detected oxygen in samples from the Amarillo and Hugoton fields; even though very delicate qualitative tests were used. Replies from a number of authorities throughout the country indicated that they had not definitely proven the occurrence of oxygen in natural gas. Minute amounts have been reported[1], however, in gases from some California fields. Of course oxygen from admixed air may be present in natural gas obtained under vacuum.

As was stated in the section on development, laboratory tests failed to show that any detectable corrosion of copper, brass or bronze would be caused by the concentration of ammonia in natural gas required for gas hydrate prevention — giving strength to the theory that in the absence of oxygen, ammonia will not corrode copper-bearing alloys. Inspections by two companies who have injected ammonia agree that no damage to brass or bronze fittings resulted from such injections.

Insofar as the matter of the corrosion of steel is concerned, it has been shown that an alkaline solution, such as formed by ammonia dissolved in condensed water in a pipe line is quite effective in retarding corrosion; and since corrosion occurs in the presence of water, the effects of ammonia injection would appear to be wholly beneficial to steel pipe and fittings. Furthermore, if sulphur compounds are present in the gas stream, the injection of ammonia may be effective in allaying the corrosive action of these on the pipe. Ammonia has been used in petroleum refining for this purpose for a number of years[7].

To summarize, laboratory and field tests indicate that in the absence of oxygen, concentration of 42 p.p.m. of ammonia in the gas stream will not cause the corrosion of brass or bronze fittings in a pipe line. The

(Continued on page 32)

"Shucks, I can turn all mine off in
60 seconds . . . they're Nordstroms"

PERFECT APPLICATION OF A PRINCIPLE

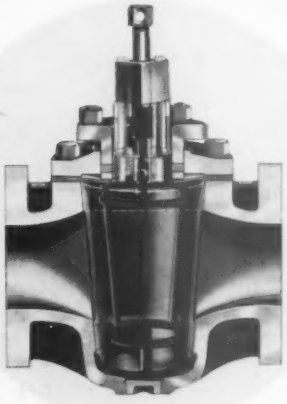
WHY *a plug valve?*

A plug cock is the oldest design of valve known. Simplest to operate. Quickest to open or close. Absence of exposed seats and threads, sliding plates and channels permit longer life.

WHY *a lubricated plug valve?*

A plug valve, particularly larger sizes and when handling high pressures or corrosive line contents, will stick and seize unless a means is provided for lifting the plug and for keeping its surfaces lubricated.

WHY *a "Sealdport" lubricated plug valve?*



In Nordstrom Valves a plastic lubricant is efficiently distributed over the entire bearing surfaces by means of the exclusive, patented "Sealdport" method of hydraulic lubrication. "Sealdport" lubrication forms a pressure seal substantially around the ports of the valve. There is no "break" or opening in this pressure seal where line contents can channel through. Internal and external leakage is prevented. Nordco lubricants are furnished in every desired consistency, having various lubrical and plastic properties. Years of research have resulted in a line of lubricants that are best adapted to each valve service.

(Please request Lubricant Manual)

ONLY NORDSTROMS MEET EVERY MAJOR VALVE NEED

MERCO NORDSTROM VALVE CO. *A Subsidiary of* **PITTSBURGH EQUITABLE METER CO.**

Main Offices: Pittsburgh, Pa. *Branch Offices:* **New York City, Buffalo, Philadelphia, Columbia, Memphis, Atlanta, Chicago, Kansas City, Tulsa, Houston, Los Angeles, Oakland.** *Canadian Representatives and Licensees:* **Peacock Brothers, Ltd., University Tower Building, Montreal, Quebec.**

NORDSTROM VALVES

LUBRICATED PLUG

PATENTED "SEALDPORT" LUBRICATION

Ways To Avoid Liability For Explosions Of Gas

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

CONSIDERABLE discussion and controversy has arisen recently with respect to ownership of service pipes which extend from a gas company's main lines through private property and into private buildings.

It is important to know that various courts have held that in order to determine the true ownership of service pipes, testimony must be taken to show the relations, with respect to contracts and agreements, between the gas company and the injured or damaged consumer.

As to pipe lines, main, meters, service pipes, etc., that belong to the gas company the law is well settled that in order to avoid liability for injury or damage to person or property resulting from escaping gas, the gas company must use due and reasonable care in the inspection of its pipes, to insure reasonable promptness in the discovery of leaks that may occur from defects in or deterioration of pipes and valves, from wrongful meddling with its equipment on the part of others, or from any other cause within ordinary and normal anticipation of experienced gas company officials and employees. This law is applicable to all pipe lines, and equipment, owned by gas companies.

Therefore, because of this established law, considerable effort should be put forth by all officials of gas companies to properly and frequently inspect its lines and equipment and *records should be kept to prove* that these inspections were made.

However, this law is *not* applicable to service pipes and equipment *owned by the consumer.* In other words, the gas company is not responsible for defects and leaks in pipes, equipment and accessories owned by property owners, as the latter must inspect these and know that they are not defective and dangerous.

On the other hand, it is advisable, under all circumstances, for gas company officials to send a competent employe to inspect premises when a property owner reports a gas leak. This is advisable in order that the company may have proof, if it is subsequently necessary, that the company pipes and apparatus were *not* defective.

Ownership of Service Pipes

For these various reasons it is advisable for all gas company officials to become informed when, and under what circumstances, service pipes actually are owned by the company.

For illustration, in Sekela v. Tokarz, 6 N. E. (2d) 489, reported March 10, 1937, it was disclosed that a property owner applied for gas service. He signed a contract with the gas company which provided that if within thirty days from the time the connection was made a gas range was put in use, seventy feet of the connection, beginning at the curb line, would be run at the expense of the gas company, and the property owner agreed to pay for the balance at fourteen cents a foot. The range was put in and the gas company billed the property owner for sixty-nine feet of the pipe at fourteen cents a foot, which would amount to $9.66. This bill, however, the gas company never made any serious effort to collect, and apparently voluntarily charged the claim off its books.

Also, the property owner expressly agreed in his application to "abide by all reasonable rules and regulations prescribed by the company governing gas service pipes and installation."

Since 1917, when the service pipe was installed, it has continuously remained imbedded in the ground. And during all this time the property owners have received gas from the company it was delivered into that part of the service building used by the different occupants as a dwelling. The gas company never made an inspection or examination of the pipe, nor was it ever asked to do so until February 6, 1935. The testimony proved that on or about February 6, 1935, gas, being transmitted through the service pipe for use and consumption, escaped through the service pipe and diffused itself along the lines of least resistance into the tile drains of the property owner and entered into his greenhouse, damaging the plants to the amount of $1,000 for which the property owner sued the gas company.

In view of the above facts the higher court held the gas company liable, saying:

"Whoever may have been technically the owner of the pipe, we hold that in view of the contractual relations which existed between defendant (gas company) and the property owner with reference thereto, the duty of inspection rested upon defendant (gas company). It did not inspect, but was negligent in that regard. Plaintiff was damaged thereby. It follows defendant (gas company) is liable."

Therefore, reading and digesting this case indicates that where a gas company pays a portion of the expense of installing a service pipe, and the property owner pays the balance of the expense, the gas company is the legal owner of the service line, particularly if the contract contains a clause by which the property owner is not required to pay any part of the expense of installing the service line, if he installs specified equipment or uses a stipulated quantity of gas over a stated period. Under these circumstances the gas company is obligated to make frequent inspections of the service pipe in order to be certain that no gas leaks therefrom and results in injury or damage to person or property. This is particularly true if the gas company fails to include in the contract with the consumer a valid clause that the latter is legal owner of the service pipe and must keep it in good order and replace it at his own expense when conditions require.

Property Owner Owns Service Lines

Obviously, therefore, in view of the above explanations respecting service pipes, if the property owner is legal owner of such pipes, the gas company is under no obligation to inspect and keep them in good and safe condition. And in order to verify this statement a leading case, Clare v. Bond Gas Company, 356 Ill. 241, will be explained.

In this case it was shown that a building had been piped for gas about twenty-five years previously.

The property owner desired to heat her shop with gas and hired a plumber to install a gas stove which he obtained from the gas company. After its installation she noticed an offensive odor, and she notified an official of the gas company who, with the plumber, examined the premises, and came to the conclusion that the odor was caused by fumes of burned gas. He recommended that a pipe be extended from the stove to the flue to carry off the fumes; this was done, but the trouble continued. Again, upon the suggestion of the official, the flue was cleaned, the pipe cemented to it, and the height of the flue raised in order to remedy the trouble. There was no improvement. The plumber made three inspections but found nothing wrong.

The pipe from the curb box into the building belonged to the owner of the building and not to the gas company. The official of the company tested the meter and the connections with a lighted match. Afterward he and the plumber tested the meter to ascertain if there was any leak. Several weeks afterward a man named Williams was searching for a screwdriver; he opened the door of a closet, holding a lighted match in his hand, and an explosion occurred causing serious injury and damage. It was afterwards discovered that the pipe under the floor contained holes caused by rust which allowed the gas to escape. Since this pipe was owned by the property owner the higher court refused to hold the gas company liable, saying:

"The law is equally well settled that where a gas company does not install the pipes or fixtures and does not own them and has no control over them, it is not responsible for their condition or for their maintenance; and as a result is not liable for injuries caused by a leak therein of which it has no knowledge. * * * In the absence of notice of defects, it is not incumbent upon a gas company to exercise reasonable care to ascertain whether or not service pipes under the control of the property owner or the consumer are fit for the furnishing of gas. As a general proposition, a person's duty can extend no further than his right, power, and authority to carry it out. It cannot be seriously urged that the employes of a gas company have the right to go upon the premises of one of its customers for the purpose of inspecting his pipes or other fixtures except upon the invitation, license, or permission of the owner."

The important testimony in this case, which relieved the gas company from liability, was the fact that the testimony proved conclusively that a gas company official and a plumber had thoroughly and completely inspected all pipes, meter connections, etc., owned and installed by the gas company which testimony proved that the meter and connections owned by the gas company were *not* defective. Therefore, when it was discovered that the service pipe had holes in it, it was logical to decide that the gas had escaped from these holes, and *not* from any equipment owned by the gas company.

Therefore, it appears that the law is well settled that a gas company is not responsible for injuries caused by gas leaks in service pipes owned by private property owners. Furthermore, gas company employes are not required to inspect and keep such pipes in repair, but after inspecting its own apparatus, such as meters, connections, and the like, and proof is established that the same are not defective, the responsibility is on the property owner to inspect and repair his own equipment, as furnaces, stoves, service pipes, and the like. Obviously, however, if a gas company supplies or sells such equipment, it is proper and advisable that when a complaint of leaking gas is made that efficient gas company employes inspect such equipment in order to determine positively whether it is defective. If it is found to be not defective and the property owner owns the service pipes and other equipment, the gas company employes should immediately inform the property owner that the gas company's responsibility is at an end, and that the property owner must employ competent persons to inspect and repair his equipment and service lines.

Installations and Repairs

In order to avoid liability for injuries caused by defective equipment either sold or repaired by a gas company, the company must notify the property owner of all known dangers, and if the equipment is defective the company should notify the property owner to have property repairs made *before* using such apparatus.

If the apparatus was sold by the gas company, under a guarantee, the company is bound to make the repairs, otherwise the apparatus should be disconnected from the gas lines and the property owner notified to make the repairs.

For example, in Phoenix v. Texas Cities Gas Company, 100 S. W. (2d) 156, reported March 16, 1937, it was disclosed that a property owner purchased from a gas company a gas furnace which the company installed in the basement of the house. The furnace was equipped with two pilot light burners. It was controlled by a thermostat which operated automatically. After the furnace had been installed for four years the property owner requested the gas company to do some work on the furnace. A gas company agent called and started the furnace in operation. Shortly thereafter trouble developed. Afterward the gas company agents came in response to a request and inspected the furnace and performed more repairs. The gas company employees informed the property owner that the pilot light was defective; that it might last through the winter, but a new one would have to be installed for the next winter. Nine days later an explosion occurred.

The court, after taking testimony, decided that the explosion was caused by a defective pilot light and indicated liability of the gas company, saying:

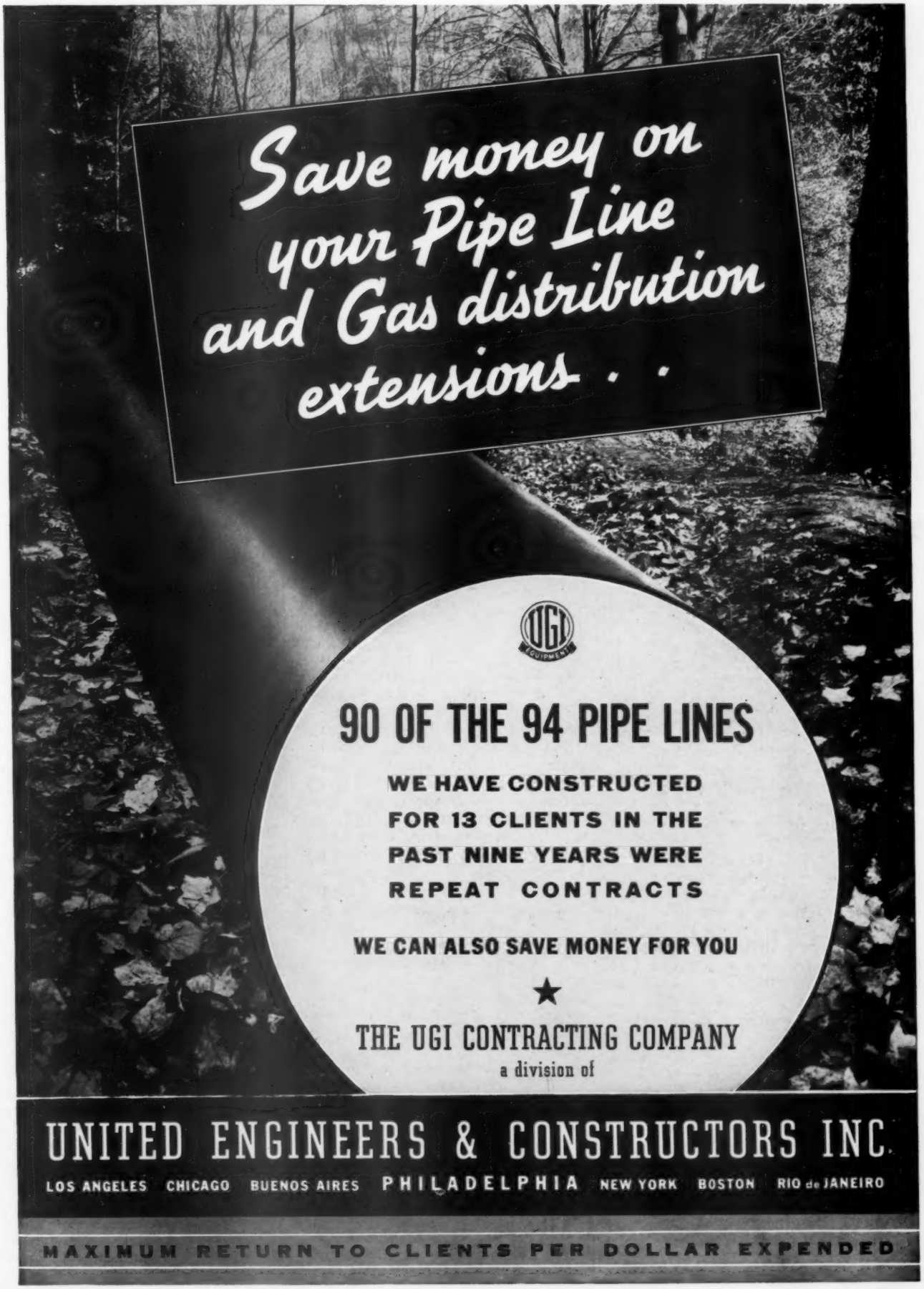
"Under all the facts . . . issues of actionable negligence upon appellee's (gas company's) part were raised in failing to make a proper inspection when it undertook to do so, and in failing to replace or properly repair the pilot light found to be defective, or warning the tenant or owner of the defective pilot light and danger incident to the continued use of the same so as to afford the tenant or owner the opportunity of having such light repaired or replaced."

Difference in Proof

In criminal cases, a person cannot be convicted of crime unless the testimony indicates beyond a reasonable doubt that he is guilty. However, this rule is *not* applicable in suits filed by persons injured by gas explosions.

For example, in Northwest States Utilities Company v. Ashton, 65 Pac. (2d) 235, reported March 19, 1937, it was disclosed that a property owner made several complaints about detecting gas fumes but the gas company employes, who were sent to inspect the premises, failed to stop the leaks which were in the cellar. An explosion occurred for which the property owner filed suit.

The jury held the gas company liable, in view of circumstantial evidence submitted by the property owner. The higher court upheld the verdict, and said:


Save money on your Pipe Line and Gas distribution extensions . .
UGI EQUIPMENT
90 OF THE 94 PIPE LINES
WE HAVE CONSTRUCTED FOR 13 CLIENTS IN THE PAST NINE YEARS WERE REPEAT CONTRACTS
WE CAN ALSO SAVE MONEY FOR YOU
★
THE UGI CONTRACTING COMPANY
a division of
UNITED ENGINEERS & CONSTRUCTORS INC.
LOS ANGELES CHICAGO BUENOS AIRES PHILADELPHIA NEW YORK BOSTON RIO de JANEIRO
MAXIMUM RETURN TO CLIENTS PER DOLLAR EXPENDED

(Continued from page 30)

"While it is undoubtedly true that in a criminal case, the defendant being entitled to an acquittal unless proved guilty beyond all reasonable doubt . . . we do not think the same rule should be applied in a civil action where the duty of the jury is to determine no more than on which side lies the preponderance of the evidence."

Also, in Wielms v. St. Louis County Gas Company, 37 S. W. (2d) 454, a lower court rendered a verdict against a gas company amounting to $7,000 as a result of injury and sickness to a citizen caused by the escape of gas from a main located adjacent his home.

The gas company appealed to the higher court on the grounds that the evidence did not indicate conclusively that the injury resulted solely from inhalation of the gas. However, in view of the testimony given by physicians, the higher court affirmed the lower court's verdict.

Gas Hydrates in Natural Gas Pipe Lines

(Continued from page 21)

2. Where it is impracticable to dry the gas, install means of checking the gas temperatures at intervals along the line.

3. Keep a check on the gas pressures in the line at corresponding points.

4. Determine or estimate the hydrate formation characteristics of the gas being transported, and insofar as possible keep the pressure of the line under that at which the hydrates will form. If it is necessary to operate in the region of temperature and the pressures where hydrates form, operate the line at conditions favorable to decomposition at least part of the time and remove the water released upon hydrate decomposition from the line.

5. Recording pressure gages and recording thermometers placed at intervals along the line furnish desirable operating information. If the pressure record indicates abnormal pressure fluctuations the presence of water or hydrate in the line may be suspected and remedial measures used to avoid a serious stoppage of the line.

Future Program of the Bureau

Many questions concerning gas hydrates remain to be answered. The Bureau expects to continue this investigation, with the aid of the Natural Gas Department of the American Gas Association, in an endeavor to clear up these questions. The helpful cooperation of the industry in the work that has been done is highly appreciated, and continued cooperation in furnishing information that will assist in obtaining practical solutions of the various problems is solicited.

[1] Hammerschmidt, E. G., Formation of Gas Hydrates in Natural Gas Transmission Lines: Ind. Eng. Chem., vol. 26, August, 1934, pp. 851-5.

[2] Hammerschmidt, E. G., Gas Hydrates: Amer. Gas Assoc. Monthly, vol. 18, No. 7, 1936, pp. 273-6.

[3] Villard, Sur quelques nouveaux hydrates de gaz (Some new gas hydrates): Comptes rendus, vol. 106, 1888, pp. 1602-3; vol. 111, 1890, pp. 302-5.

[4] De Forcrand, Sur la composition des hydrates de gaz (The composition of gas hydrates): Comptes rendus, vol. 135, 1902, pp. 959-961.

[5] Johnson, T. W. and Berwald, W. B., Flow of Natural Gas through High-Pressure Transmission Lines: Monograph 6, Bureau of Mines, 1935, p. 53.

[6] Deaton, W. M., Gas Hydrates and Their Relation to Pipe-Line Operation: Gas, vol. 12, no. 6, June, 1936, pp. 20, 58 and 59.

[7] Miller, R. W., Hydrocarbon Hydrates: Chemical Committee Report, Amer. Gas Assoc., 1936, pp. 27-30.

Anhydrous Ammonia

(Continued from page 26)

occurrence of oxygen in natural gas has not been established.

A final restriction on the injection of ammonia into gas transmission lines arises because of the possibility that it might react with carbon dioxide in the gas stream and form an obstruction of solid ammonium carbonates. However, concentrations as high as 130 p.p.m. of ammonia have been injected continuously in the laboratory without causing the formation of any solid phases and ammonia has been injected in field and main lines by at least two companies during the past two winters without any trouble caused by salt plugs. The rather large quantity of dissolved gases in the drip fluid may be a factor in preventing the appearance of solid phases.

Suggested Applications of Ammonia Injection

Because of its economy and versatility, a number of applications of continuous ammonia injections in connection with the transmission of natural gas readily suggest themselves. A few typical applications are mentioned below.

Main transmission lines may be protected by continuous ammonia injection. This form of protection may be especially desirable in the case of small lines. A company obtaining its supply from two or more fields may find it desirable to protect the lateral lines from each field by ammonia injection. Main field gathering lines may be protected by ammonia injection, and in some cases it may be desirable to similarly protect individual well lines. Points along a line at which excessive trouble with hydrate obstruction occurs, such as river crossings, may be maintained open by injecting ammonia ahead of the point where the obstructions form.

The author gratefully acknowledges the assistance of individuals who have contributed to this work. Thanks are especially due F. C. Walters and D. K. Stephens, both of the Panhandle Eastern Pipe Line Company, and Dr. J. F. T. Berliner of E. I. DuPont de Nemours & Company.

H. C. COOPER

H. C. Cooper Receives "40 Year Pin"

Eight hundred employees of the Hope Natural Gas Co. met on the evening of April 22 at Clarksburg, W. Va., when Mr. Howell C. Cooper, President of the company received his "40 year pin." It marked the completion of 40 years service with the Hope group of companies. The pin, a lapel emblem set with three small diamonds, was presented to Mr. Cooper by Mr. R. W. Gallagher of New York, Director of the Standard Oil Co. of New Jersey. Mr. Cooper is the eighth person in the history of the company to receive such an award. Only two others with 40 years of service are still active employees.

Dustproofing Coke with Cold Oil Spray

By
I. J. True
Providence Gas Co.,
Providence, R. I.

COMPETITION of modern fuels calls for the removal of customer irritants. Dust treatment of coke must make the dust particles cling to the coke, or if separated, to make them too heavy to air float. Oil mist makes fine dust so heavy it settles very quickly. Oil, unlike water, does not rapidly evaporate, and thus makes a fairly permanent live treatment.

From an operating standpoint straight oil is easily applied in comparison to other treatments. However, the use of oil may cause odors to come from the fuel bin or heater which may result in misunderstanding as to the source. The problem thus becomes one of balance and compromise, and in some cases, education.

Ideal Dustproofing Agent

The following is taken from Bureau of Mines Information Circular No. 6932, which gives a good resumé of dustproofing solid fuels by various methods:

"Some of the characteristics an ideal treating agent should have are: (1) effectiveness for the period of time desired, (2) low cost per ton of fuel effectively treated, (3) no harmful effect on person, clothing, or equipment, (4) lack of odor in the consumer's bin, (5) no danger of flash-back or rapid evolution of obnoxious gases on firing, (6) freedom from the possibility of freezing in spraying equipment, (7) no increase in the tendency for fuels to cake or lump in freezing weather, (8) no deleterious effect on the combustion characteristics of the fuel or on the fusion point of the ash, (9) no deleterious effect on the storing qualities of coal."

General Process of Oil Spraying

Oil sprays are now used for laying dust on solid fuels without the use of any diluting agent such as water. It may be applied to the fuel either by atomization depending on heat and moderately low pressure, or by the so-called cold oil process which depends for atomization on high pressure. This latter process as just installed at the Manufacturing Plant of the Providence Gas Company is described in this paper.

This system was adopted because of its simplicity and promise of lack of trouble. As yet we are in the experimental stage, and can tell of but limited experience.

Coke Manufacture and Handling at Providence

At Providence our coke is made in Koppers by-product coke ovens from two grades of coal blended so as to obtain a volatile matter of about twenty-eight per cent. This mixture is pulverized so that approximately seventy-five to eighty per cent will pass through a one-eighth inch square mesh sieve. The coke produced is dense and of small cell structure. The coke as pushed from the ovens is water quenched. Most of the coke sold is by truck delivery, and all of it is rescreened immediately before loading. These things help in reducing the dust problem.

The truck loading is done at thirteen spiral loading chutes fed by vibrating rescreens under the screen house bins, while one rescreen fed by conveyor loads railroad cars. The loading of trucks is controlled by the driver standing at yard level. His procedure for getting a load is as follows: He starts the rescreen, opens the cutoff gate by pulling a lever, coke starts to flow over the rescreen, an arm on the cut off gate opens a quick-opening valve in the oil circulating line and allows oil mist to spray onto the descending coke. The control of the quick-opening valve is thus automatic and timed almost instantaneously with the coke flow. This is important. The oil for carloading is controlled manually, as here the loading time is much longer.

History at Providence

Up until the time of our adopting the cold oil spray process the only treatment for dust used was to sprinkle the loaded truck with water. This did a fair job at the time of delivery, but gave operating troubles in the freezing weather. Also, drivers occasionally would omit the water. This water treatment is not lasting in heated cellars.

During the Summer of 1936 we installed the apparatus for oil spraying, and around the last of October started deliveries of oil treated coke. In November and December some complaints resulted. These were mostly odors of oil from the bin or heater. It was therefore considered prudent to discontinue temporarily the oil treatment until the source of trouble could be determined.

At the first of the treatment the coverage for all loads was high and as time went on this was gradually brought down. Little by little we became aware that even though we had a reasonable average coverage for all loads there were individual loads improperly treated, due primarily to the coke loading rate varying and the oil rate remaining constant.

Much time was consumed in revamping the method of controlling the coke flow into the trucks. Due to lost motion causing variation in the gate opening, and also partial bridging of the coke in the chutes, the loading rate was anywhere from one ton per minute to two tons per minute. With a constant oil flow, this variation caused a coverage of from two-tenths of a gallon per ton to six tenths of a gallon per ton or greater. Coke loaders aggravated this still more by not fully opening the gate.

At the present time we are controlling the coke flow with a square nozzle with straight sides set into the drawoff chute of the bin and ahead of the gate. This nozzle meters the coke so that when the gate is fully opened the nozzle will only pass one and one-half tons per minute. The handles and levers are arranged so that it is easier for the loader to have the gate wide open than partially so. By chance, it so works out that if the gate is not fully open the coke immediately bridges completely. This complete bridging is good from a treatment standpoint in that partial bridging would result in over treatment.

Precautions in Design and Installation

The following precautions were observed when the system was being designed and installed:

The circulating piping kept as direct and free of pockets as possible, and kept close to the spray heads to reduce to a minimum the volume of stagnant oil in spray pipe and so that there would be but little time delay in filling empty lines. No valves were installed anywhere on

Presented at Meeting of the Operating Division of New England Gas Association, Springfield, Mass., May 7, 1937.

circulating system which through closure could cause a complete stoppage of oil.

A reversing switch was installed on the D. C. motor on the circulating pump so that the lines could be cleared when shutting down on a cold night.

During erection all ends of pipe were plugged to exclude dirt, the inside of storage tank was wire brushed to remove scale. Only new material was used on the system. On starting up there was no trouble experienced with leaks and there were only a few plugged sprays. As a matter of precaution water should not be used to flush the system as it lacks lubricating qualities which may damage the pump or it may settle in pockets and cause trouble on freezing.

After the system was installed it was considered wise to insert short sections of flexible hose between the circulating pipe and the spray pipes. This was to eliminate the danger of the small spray pipes breaking due to unequal periods of vibration set up by the rescreens. The hose used is a standard product and is known as hydraulic control hose.

Point of Spraying

Spraying to be most effective should be done just before the coke enters the truck and at a point where it is in turbulent motion. We chose the delivery end of the rescreen at which to aim the spray. Experience proved this a mistake as considerable mist carried through the screen cloth into the throughs hopper and eventually made puddles of oil on a conveyor belt below. This not only made a mess, but also presented a slipping and fire hazard. Later the spray was aimed more down the chute to the truck at a point where the coke was still turbulent.

The chutes are hooded to retain the mist with easily removable sheet metal guards. The spray heads were mounted outside the hoods and allowed to shoot through a hole in the top. Collars placed around the spray heads protect them from flying pieces of coke and also divert the cone of oil mist away from stationary surfaces if the striking pin on the spray head accidentally gets bent.

Oil Drippage

We have experienced trouble with drippage after the coke flow stopped caused by the following things: a small amount due to leaky quick-opening valves, some to the spray pipes slowly draining after the quick-opening valve had shut. At times the coke bridged so much that the spray was going onto an empty chute. Improperly directed spray heads caused the oil to hit stationary surfaces where there was nothing to absorb the oil. This drippage naturally collected and ran down onto whatever was below.

There has been some complaint from truck owners due to this oil drippage spotting hoods and windshields as the trucks drove under the loading chutes. This may be a perpetual source of trouble, but on a reduced scale. It was interesting to note the alarm on the part of some drivers when we started spraying, as they thought we might be using a material which would cause corrosion.

Coke Density vs. Coverage

The amount of oil sprayed on coke is known as coverage and expressed as gallons of oil per ton of fuel treated. Too little coverage means that float dust is not held down; too much means danger of odors. Since both the oil flow and coke flow go to make up the coverage neither can vary too much. In our case we have experienced the most trouble in regulating the coke flow.

Apparently hard, dense coke is critical to coverage in that but small variations will change the complaint from one of dust to one of odor. Softer and more porous coke probably absorbs oil readily and is less critical to variations in coverage so that fewer odor complaints result. There is probably a similar relationship between coverage and coke size.

Anyone contemplating dust treatment must study all their conditions, decide what they are, what is wanted, and what can be done from an operating standpoint. Satisfactory results can be obtained with the cold oil process.

Coverage, Effectiveness and Dust Measurement

One producer of dense coke has the working range of coverage from .15 to .2 gallons per ton, while another has a .25 to .3 gallons per ton coverage. Effectiveness does not increase much above .3 gallons per ton until the point is reached where the coke is thoroughly saturated with oil. We are endeavoring to maintain a coverage of .2 gallons per ton, which is slightly less than a quart of oil to a ton of coke. Dust with too little oil on it will float, and this oil laden dust will make a smear.

In well treated coke it is possible to lay the dust so thoroughly that there is a complete absence of dust flying in the consumer's bin as he shovels it, even though avalanching takes place. Any dust left at the bottom of the customer's bin is heavy and does not float. It has the appearance on sweeping of forming small balls. The dust as dislodged from the coke is so fine that it passes through a 65 mesh sieve. Anything between 65 mesh and one-quarter inch square mesh sieve is called attached breeze and will not float.

An apparatus and a method for measuring dust on solid fuel has been made by Powell and Russell and is described in the Bureau of Mines Information Circular No. 6932 referred to before. A committee of the A. S. T. M. is working on a standard test for dust measuring. The test referred to above consists of dropping fifty pounds of dry coke four feet inside a dust tight chamber and allowing the float dust to accumulate for a definite time on removable collecting plates. The grams of dust collected per ton of coke is an index of effectiveness of treatment. By this method of measurement untreated coke will run around 200 grams per ton while treated coke will be as low as twenty-five grams per ton. If the dust collected on these plates is placed on a sheet of white paper the dust from an untreated sample will tend to flow as a fluid, while treated dust will pile up. Also the untreated dust is so fine it will settle in the pores of the paper and make a discoloration.

Fire Hazards at Point of Spraying

The oil used will ignite. I have heard of two cases in other plants using this method where either the oil mist ignited or an accumulation of oil dust caught because of some open flame, but in neither case fortunately did serious damage result. The use of salamanders or open flame torches is not recommended in the vicinity of the oil sprays.

To summarize — the following points should be observed. Keep oil clean. Pipe lines should be simple and direct. A circulating system is necessary. Oil must be fluid at low temperatures. Spray tips must be kept aimed right, and the shut-off valves must work quickly and positively. Make periodic measurements of oil rates on individual sprays and coke rates on individual chutes and from these check the coverage. Compare coverage, dust measurement tests and customer complaints.

While there are imperfections in this system for dust treating coke there are many good features and the resulting product is acceptable to the consumers.

Use of Oil for Dustproofing Coke At Springfield*

By

C. H. Thorington

Chief Chemist
Springfield Gas Light Company
Springfield, Mass.

WE switched from calcium chloride to oil for dustproofing coke at Springfield in the summer of 1935. As a result of this change we gained several objectives which can best be explained by comparing the two methods of treatment.

In the first place, we use the so-called "Hot Vapor Process" of oil spraying which is the simplest method that we could find. It requires no extra labor, there is no mixing of any solutions, no pipe lines to give trouble in cold weather and the coke can be sprayed as it is screened. There is only one precaution in its use—don't spray too heavy nor too light.

With calcium chloride, extra labor was required to carry the bagged salt to the storage-mixing tank and then the solution had to be prepared. And, owing to its corrosive action on metallic surfaces — inhibitors notwithstanding—it was not good practice to spray the coke with the chloride as it was screened.

This required the installation and maintenance of sprays at each of four truck loading chutes. Thus the coke was sprayed after sizing and while on its way to the trucks. Even though these sprays were placed beyond the Hunt screen in the chutes the chloride mist raised havoc with screens, motor castings, chute plates and other equipment. The maintenance of this equipment was the "straw that broke the camel's back" and forced us to use oil.

Simplifies Treatment

Since oil is not destructive to metallic surfaces, its use has greatly simplified our method of coke treatment.

For example, the Run of Retort Coke first passes over a ¾" vibrating screen which removes the breeze. The remainder of the coke continues on to a 2¼" vibrating screen, which sizes it into "Mixed Coke" and "Lump Coke."

We apply the oil to the coke just as it leaves the ¾" screen and comes onto the 2¼" screen. By this arrangement, we are able to apply all the oil needed at one station, no Breeze is sprayed and both the "Mixed Coke" and "Lump Coke" are treated in one operation.

We use a refined oil of the following general characteristics:

Sp. Gr.	.905
Vis. @ 100°F	115
Four Point	—20°F
Flash Point	340°F
Fire Point	375°F

This oil is used straight, that is, just as it is received except that when applied it is heated to about 150°F and is sprayed at 80 pounds pressure to secure good atomization.

Nozzle Arrangement

The nozzles are placed about 18 inches above the screen and are inclined, so that the coke travels at right angles to the plane of the spray. The screen is 45 inches wide and by means of three nozzles spaced at equal distances the entire cross section of the screen is covered. Thus, all coke that comes onto the 2¼" screen must pass through the oil mist.

As dust proofers we found that calcium chloride and oil are about equal, regardless of the place of application. The following table will show this.

Grams Dust per Ton of Coke

Treatment	Lump Coke	Mixed Coke
Oil	15	20
Calcium chloride	20	26

Relative Costs

The material cost for oil, per ton of coke sprayed is somewhat less than it was for calcium chloride. That is, with 2.5 quarts of 6.5c oil the cost is 4.0c per ton while with 2.5 gallons of an 18% solution of calcium chloride the material cost was 5.7c per ton.

We found that calcium chloride gave an odorless and smokeless coke. And, while oil treated coke is not absolutely odorless and smokeless it is not especially objectionable. New customers are more liable to complain of "white smoke" and "gas odor" from freshly fired coke than older customers.

The majority of complaints came during our early trials with oil spraying and may be charged to inexperience. Nevertheless, oil treatment requires careful watching to keep it under control.

We believe that oil does as good a dust proofing job as calcium chloride did. In addition to the credit of oil, we have: (1) Decreased maintenance cost, (2) decreased spray material cost, and (3) simplification of spraying procedure.

Presented at Meeting of the Operating Division of New England Gas Association, Springfield, Mass., May 1, 1937.

Dustless Coke†

By

R. C. Downing

Lowell Gas Light Company

SINCE the subject under discussion is the use of oil for dustproofing coke, we will pass rapidly over the experience with calcium chloride, except to state that after a few years it was very difficult to keep electrical equipment in the coke screening plant operating because of the corrosive action of the chloride mist. Because of local delivery conditions we found it more satisfactory to spray on the coke screen rather than at the delivery chutes. This prevented the complaints from corrosion of truck bodies which we had heard was the experience of others. It also stopped customer's complaints about dust but started some remarks about the difference in color of the coke. We received a few calls about corrosion in the customers' coal scuttles and flue pipes. As a dustilizer, calcium chloride is superior to other materials because of its hygroscopic property.

When the decision was made to change to oil, the hot oil process was considered but not because we found that it would be more expensive, and the equipment used for chloride was readily adapted to emulsion spraying, whereas, all new equipment would have been required for the oil process. We experiment-

ed some with various preparations and finally decided on a product made by the Sun Oil Company known as Coalkote "B," which is a heavy black concentrate, odorless, non-corrosive and free from vegetable oils and soaps. This oil could be obtained in 50 gallon drums at a reasonable price and handling done in our existing tank system.

Assuming that a few of the gentlemen present may be interested in the method of producing the emulsion we believe it sufficient to state that we utilized a 500 gallon lime agitator, formerly used in the ammonia concentrating plant, for our solution tank. It was set up in a warm place in back of our waste heat boiler, accessible to steam and water connections and adjacent to the producer charging floor. The Coalkote is solid at ordinary temperatures and must be heated to 185° F. before it can be pumped. We do this by rolling the drum onto the producer coaling hole, being sure to keep the plug in the drum head on top and removing as soon as the drum starts to heat. Twenty minutes is a sufficient time to heat the material to the desired temperature, after which the drum is trucked about twenty feet to the agitator. A hand pump is used to transfer the 50 gallons into a 110 gallon drum above the agitator. Hot water is added and live steam for agitation until the 100 gallon mark is reached. Next 50 gallons of this one to one emulsion is drawn off into the agitator and mixed with 350 gallons of hot water to make a 15 to 1 emulsion.

The spray system consists of a 2 x 3″ Worthington Single Acting Triplex Pump, belt driven by a 3 H.P. Motor. The pump is capable of delivering 13 gallons per minute at 200 pounds pressure, but we control it at 100 lb. per square inch. About 100 feet of ¾″ piping wrapped with ½″ steam line delivers the emulsion to the sprays. The Spraco Fan Type Nozzle gives a very satisfactory spray. It is rated to deliver .8 gallon of water per minute. In order to get good coverage, two sprays were installed three feet apart on the screen. As the coke tumbles, a new surface is exposed and the sticky material covers and seals this surface.

The cost of spraying with Coalkote by this method and with Calcium Chloride are shown in the following table. Our rate of production is about 100 tons per day, and only the sizes ranging from No. 1 Nut and up are sprayed.

TABLE SHOWING SIX YEARS EXPERIENCE WITH SPRAY MATERIALS

Year	Pounds of Calcium Chloride per Ton	Cost of Materials for Spraying per Ton	Gallons of Coalkote "B" per Ton	Equivalent Gallons of 1-15 Emulsion	Cost of Materials for Spraying
1931	3.87	5.18c	...	...	....
1932	4.00	5.36c	...	...	....
1933	3.90	5.23c	...	...	....
1934	...	....	.201	3.22	2.92c
1935	...	....	.226	3.61	2.48c
1936	...	....	.283	4.53	2.83c

SUPERIOR

Diaphragms
Provers
Repairs
Service Cleaners
Gas Meters

SUPERIOR METER CO.

Brooklyn, N. Y.
167 - 41st Street

Eleventh Annual Conference of A. G. A. Production and Chemical Committees

Photos Courtesy American Gas Association

Snapped here and there during the Conference: E. J. Murphy, Brooklyn, presides at luncheon; R. D. Williams, Troy, replies to discussion on his paper; H. D. Meredith, Kearny, N. J. talks about "New Wrinkles", Leon J. Willien, Chicago, expresses "A New Idea in Gas Manufacture", R. H. Arndt, Baltimore, replies to questions on "Automatic Grates" and A. R. Bayer, Brooklyn, talks on the "Stoppage Problem."

WITH that absence of ostentation which is so characteristic of the technical side of our industry the Annual Conference of the A.G.A. Production and Chemical Committees was held at the Hotel New Yorker, New York City, on May 24th, 25th and 26th.

Seldom does anything spectacular emerge from these meetings. The same subjects appear on the program year after year; progress is reported, ideas are exchanged and suggestions are made as to how the problems can be further attacked. This type of methodical and persistent effort and painstaking research by our technical men has been largely responsible for the development of the gas industry. An attendance of about 350 indicates that our enthusiasm for pure science and technical research has not abated in an era when the spotlight is on the sales department.

Following the opening remarks by the chairman of the Production Committee, R. E. Kruger, Mr. Alexander Forward, Managing Director of the A.G.A., extended a greeting to those in attendance.

A commercial note was struck by one who said he knew nothing of the technical side of our business. Mr. B. J. Mullaney, Vice President of Peoples Gas Light and Coke Co. of Chicago spoke on "How Technical Men Can Also Help Sales." He said that while sales are of paramount interest, the technical men of the industry can help stimulate sales through their business and social contacts. He felt that advertising and publicity are essential tools in the promotion of gas popularity and that the national advertising campaign has strengthened the morale of the industry all down the line,—in fact it had "put the gas industry on the map."

Several of the other conference papers have been abstracted and appear in this issue of the JOURNAL and still others are scheduled for a later date.

An important feature of this annual meeting is the series of "Luncheon Conferences" at which opportunity is afforded for free and informal discussion of various technical problems. This year there were three such luncheons and the general subjects covered were: Coal Carbonization and By-Products, Water Gas Operation, Gas Conditioning and Purification. The luncheons were all well attended and the discussions distinctly animated.

Photos Courtesy American Gas Association

E. O. Mattocks, New York; J. E. Maconachie, Toronto; W. M. Couzens, Cleveland and C. G. Segeler, New York, all talk at once.

"It's this way" says D. S. Reynolds of Boston—and it seems that Victor Starzenski of Troy and J. E. Cooper of Utica quite agree.

Male Quartette?—No, it's E. C. Uhlig of Brooklyn; Prof. J. J. Morgan of New York; J. F. Anthes, Brooklyn, and L. N. Vander Pyle, of Pittsburgh, all in deep discussion.

The Economics and Operation of Automatic Grates*

By
R. H. Arndt

Assistant Superintendent of Gas Manufacture
Consolidated Gas Electric Light & Power Company of Baltimore
Baltimore, Maryland

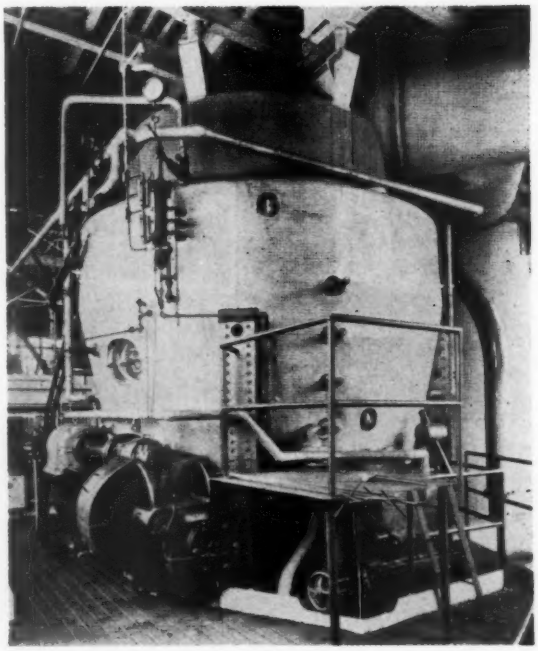


Figure 1. U. G. I. grate installation showing drive mechanism. Waterbury, Conn. (1934).

THE successful operation of the first automatic grate installations in 1924 and 1925 stimulated much interest in the idea of continuous operation of a water gas set by removing ash from the base of the generator mechanically. Although the job of cleaning the ash from a generator fire by hand was probably the most laborious and undesirable in the gas plant, it remained unchanged until that time.

Economics

Fundamentally, the economics of automatic grate installations must be based on actual reductions in operating costs and not on advantages of an intangible nature. Gas plant labor problems may be reduced and working conditions improved by the installation of automatic grates, but they cannot be installed economically on the basis of these intangible effects alone. The cost of an automatic grate installation must be paid for by reduced operating costs resulting from the more efficient utilization of raw materials and a reduction in the cost of labor per M cubic feet of gas produced.

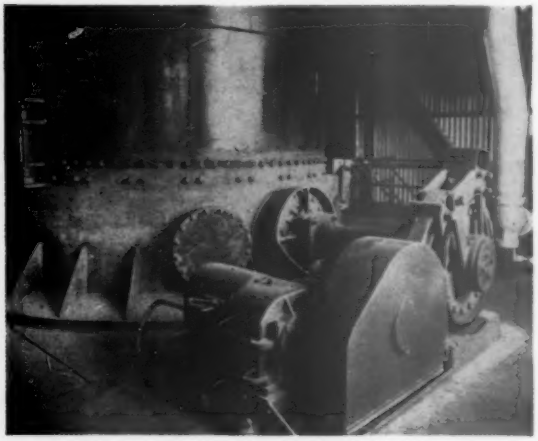


Figure 2. Recent A. B. C. grate installation showing new type of drive mechanism. Indianapolis, Ind. (1937).

Types of Grates

During the past twelve years there have been a number of different types of automatic grates developed by the various gas equipment manufacturing companies. The extent to which they have been installed has depended somewhat upon the successful application of the different types to the various methods of operation and upon the resultant effect they have had in reducing operating costs.

The United Engineers and Constructors, Incorporated, manufacture the U.G.I. or "HAUG" mechanical generator as illustrated in Figure 1. It is claimed that high capacity, high efficiency, and low maintenance costs are being secured from forty-three installations of this type of grate in operation in sixteen industrial and utility plants in the United States, and from two installations in a foreign country. The design of this type of grate consists of a raised cone grate rotating within steam producing water cooled walls at a very slow and adjustable speed continuously. Two adjustable plows located at the periphery and base of the cone remove the ash and clinker continuously from the base of the generator into two diametrically opposite ash hoppers.

"Extensive experience with this type of automatic grate has brought about requirements in design and changes to facilitate operation and to reduce maintenance costs. A progressive development has been accomplished in the ash pan so that with the present design the ash pan is in small enough sections so that it can be removed through the coal hole branch, making it unnecessary to lower the bottom to renew the ash pan as was necessary in the earlier design of this type of automatic grate. The motor drive was originally located alongside of the generator. This is now mounted on the generator. Improvements have been made in the seals, purges and drains, as were indicated by operating experience."

* *Abstract of paper presented at Production and Chemical Conference, American Gas Association, New York, May 24-26, 1937.*

The Western Gas Division of the Koppers Construction Company manufacture the A.B.C. grate, as illustrated in Figure 2. Operating results similar to those mentioned above are also claimed for this type of grate. At present there are twenty-six installations of this type in operation in seven industrial and utility plants in the United States, and ten installations in plants of three foreign countries. The design of this type of grate consists of a large "S" shaped horizontal water cooled breaker beam extending across the diameter of the generator and rotating intermittently at a very slow adjustable speed. The ash and clinker are crushed by the action of the beam moving over a flat stationary grate and drop through the openings in the grate to an ash pan below the grate. "In the more recent installations the design of the drive has been simplified by using a direct drive with a pinion on the end of a horizontal main shaft which engages the teeth on the under side of the ring gear. This change has eliminated cleaning problems incident to the earlier gudgeon gear drive arrangement, and has materially reduced maintenance. The brick supports have been simplified to a plain rugged cast iron angle construction with a minimum of exposed area next to the fuel bed. The ash pan has been made flat, enabling the use of a rugged radial type plow."

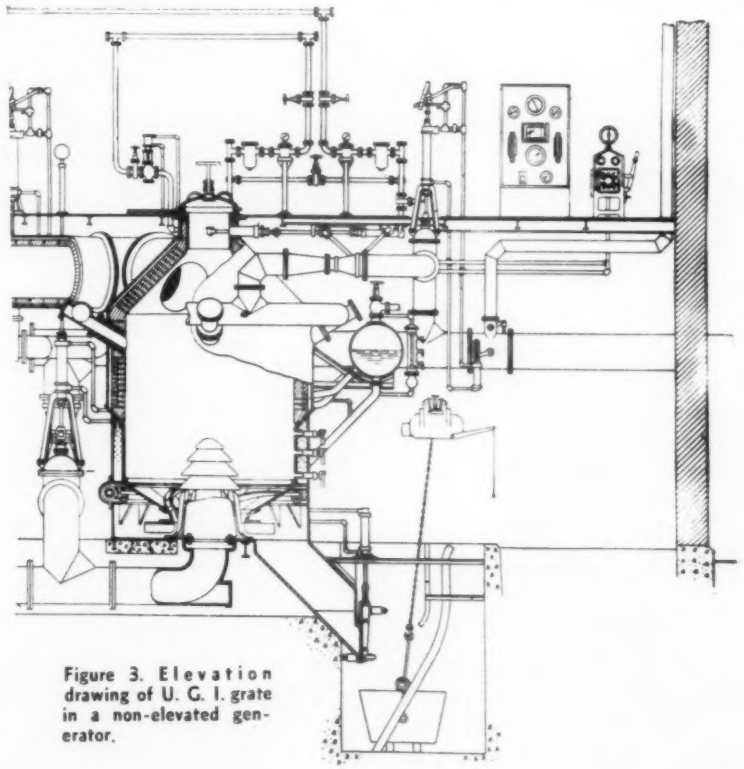


Figure 3. Elevation drawing of U. G. I. grate in a non-elevated generator.

The Semet Solvay Engineering Corporation now control the American patent rights to build and install the Power Gas Corporation's mechanical generator and grate in the United States. It is claimed that there are forty to fifty installations of this type of grate in operation in England giving satisfactory service with low maintenance costs.

The Gas Machinery Company manufacture an automatic grate which they claim gives good results on small installations, but is not adaptable to large diameter sets.

The more recent trend in mechanical grate design has been the development of grates that are applicable to non-elevated generators with flat bottom ash pans. Installations of this type, as shown in Figure 3, have been made and are giving very promising results.

Results and Savings

In the final analysis, however, the advisability of installing automatic grates in connection with various methods of operating a water gas set will depend on the results to be obtained in reducing operating costs for each dollar invested. As previously mentioned in this paper, the extent and correctness of the solution of the problem of reducing operating costs will depend on the amount of money made available for a program of plant modernization, and the proper investment of this money in modern equipment. Investments to be wisely expended in the purchase of gas plant equipment must be spent in purchasing equipment that will show a sufficient saving or profit to pay off the investment. Automatic grates are no exception to this rule. They may be sufficiently dependable for installation on base load sets and adaptable to practically all methods of operation without undue loss of flexibility to the process, but unless each installation can be calculated to show a profit, it can be of little value at this time in a program of plant modernization outlined to reduce operating costs. To calculate the saving to be expected from an automatic grate installation accurately in connection with the various methods of operating a water gas set, requires that accurate and reliable operating data be made available. Figure 4 shows the average savings that may be realized from reductions in fuel and oil made possible by the increase in the efficiency of raw material utilization resulting from the installation of an automatic grate. Figure 5 shows the range of saving in labor that may result from automatic grate installations and the average reported savings made on nineteen installations.

An endeavor has been made in preparing this paper to obtain sufficient unbiased data from a large number of experienced automatic grate operators to insure, as far as possible, accuracy in the basic operating data. The information included in this paper covers the operations of thirty-seven automatic grate installations in seventeen different plants in connection with practically all methods of set operations.

A brief analysis of some of the more important data included in this paper indicates that the effect automatic grates have had on operating results in changing the amount of generator fuel used ranges from an increase of 1.2 to a decrease of 3.0 pounds per M cubic feet. A mathematical average of the changes in the amount of generator fuel used, calculated on the basis of all methods of operation and based on the number of grates in operation in connection with the results reported, amounts to a decrease of 1.305 pounds per M cubic feet. The effect of automatic grate operations on the change in the amount of oil used ranges from an increase of 0.40 to a decrease of 0.20 gallons per M cubic feet with a mathematical average, calculated on the same basis as the average change in the fuel of

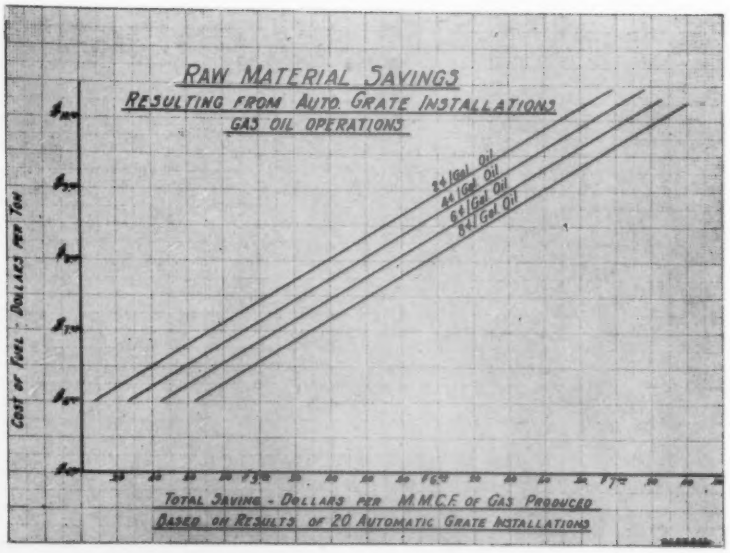

RAW MATERIAL SAVINGS
RESULTING FROM AUTO GRATE INSTALLATIONS
GAS OIL OPERATIONS
2¢/Gal. Oil
4¢/Gal. Oil
6¢/Gal. Oil
8¢/Gal. Oil
COST OF FUEL - DOLLARS PER TON
TOTAL SAVING - DOLLARS PER M.M.C.F. OF GAS PRODUCED
BASED ON RESULTS OF 20 AUTOMATIC GRATE INSTALLATIONS

Figure 4. Possible savings in fuel and oil based on average results obtained from automatic grate installations.

0.00894 gallon per M cubic feet. In connection with these basic raw materials data, it was generally reported that the more continuously the sets equipped with automatic grates were operated and the less oil or gas that was reformed in the various methods of operation, the greater were the over-all advantages and savings attributable to the automatic grates.

The general downward trend in the cost of automatic grate maintenance has been attributed to two reasons:

(1) The cooperation between plant operators and the manufacturers of automatic grate equipment in applying plant experience in the construction and control of automatic grates to reduce breakdowns and minimize repair bills.

(2) The increase in the number of plants reforming either oil or gas has reduced the grate operating speeds in some cases as much as 75 per cent, and thereby reduced the amount of wear on the grate.

The increases in set capacity resulting from the installation of automatic grates are reported as varying from 16 to 31 per cent, with an average of approximately 25 per cent. The lost time resulting from the periodic removal of ashes averages approximately forty-five minutes per day and the average frequency of ash removal is once in eight hours. In practically all cases, the lost time due to set operations is much greater than the lost time due to grate operations. The loss of fuel due to unburned carbon in the ash

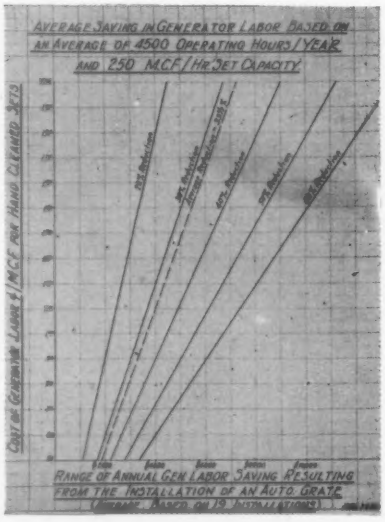

AVERAGE SAVING IN GENERATOR LABOR BASED ON
AN AVERAGE OF 4500 OPERATING HOURS/YEAR
AND 250 M.C.F./HR. SET CAPACITY
RANGE OF ANNUAL GEN. LABOR SAVING RESULTING
FROM THE INSTALLATION OF AN AUTO. GRATE

Figure 5. Range of possible labor savings to be made from automatic grate installations.

varies from 1 to as high as 40 per cent, with an average of approximately 16 per cent. The quality of the fuels used in connection with automatic grate operations varies in ash content from 2.19 to 12 per cent, with the fusion temperature of the ash varying from 2230 to 2810 degrees F. The quality of the oils used varies from a good grade of gas oil to heavy crude oils. The extent to which automatic grates have been installed in different plants based on the total plant capacity varies from 13 to 90 per cent, with an average of approximately 45 per cent. In practically all cases, automatic grates have satisfied the expectations of the plant operators and have improved working conditions. There appears to be some difference of opinion regarding the relative merits and value of dry wall and water wall installations.

The general practice used by plant operators to determine the condition of the fire is by observation of the fire periodically while the set is shut down to remove the ash. Various tests that are commonly used to determine the condition of the fire and to detect the development of side wall clinker are:

(1) Rodding the fire through the side of the generator shell to detect the side wall clinker formation.

(2) The use of pyrometers located at strategic points to indicate and record grate and bearing temperatures.

(3) To inspect the quality and determine the quantity of ash removed.

(4) By observation of the amount of power required to drive the grate.

Fire conditions are altered by changes in the air to steam ratio, changes in the percentage of "up" and "down" steam, and changes in the grate operating speed.

Gas at New York Fair

The gas industry will have its own building and exhibit at the New York World's Fair of 1939, official approval having been given by the Executive Board of the American Gas Association and the Board of Directors of the Association of Gas Appliance and Equipment Manufacturers.

H. H. Cuthrell, of Brooklyn, New York, vice-president of The Brooklyn Union Gas Company, is chairman of the Committee on New York World's Fair—1939.

"The participation of the gas industry in an authoritative and representative exhibit at the Fair is assured by the action taken by the two boards," Mr. Cuthrell declared. "The Committee in charge of this activity has had one meeting and is now laying out tentative plans for the exhibit. We hope to keep the industry advised of developments."

The large administration building will be heated entirely by gas, it was learned this week with the announcement by Stanley Finch, Coordinator for Gas Utilization, that contracts have been signed covering both the heating of the building and the water used in the building.

Four Bryant gas-fired boilers have been ordered to supply heat for the building. Two water heaters have been ordered, one being a No. 500 Ruud Multicoil and the other a No. 4 Ruud Instantaneous.

Some Aspects of the Flexibility of Plant Control With the Heavy Oil Process

By W. E. Lebo

Public Service Electric and Gas Co.
Harrison, N. J.

IT IS general knowledge that the heavy oil process has proved sufficiently flexible to be of national importance in the gas industry.

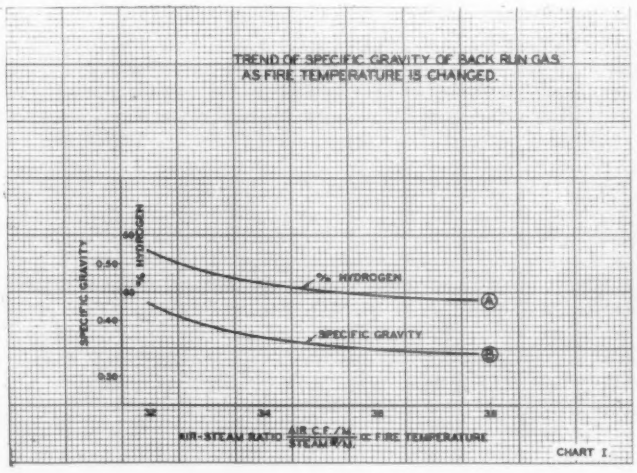
For this reason I have limited the scope of this paper to the experience of our plant operating 8-11 ft. hand clinkered Water Gas Sets equipped for the heavy oil process. In this plant we mix 530 Btu. carburetted water gas with a decidedly varying amount of low gravity, constant Btu. coal gas.

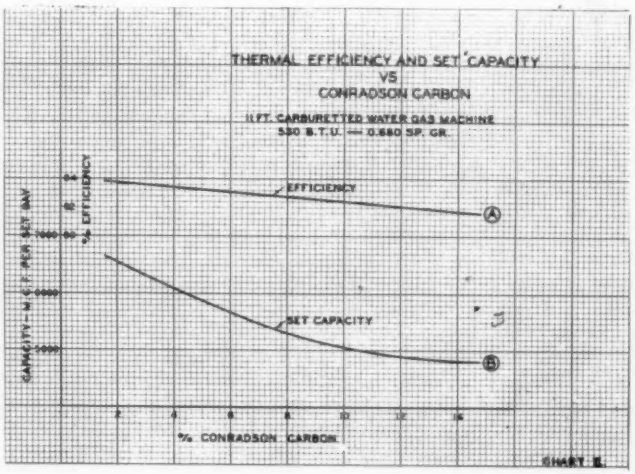
Due to the variable supply of coal gas, our main operating problem is the control of the specific gravity and quantity of the plant "make gas," so that the mixture will be of constant value. During the early stages of our heavy oil operation this control was limited by the mechanical inability to reform sufficient oil to permit the use of an appreciable quantity of blow run gas. Therefore, the set capacity was low. To partially alleviate this condition simple tests were made resulting in data expressed in Chart I. We found that by increasing the fire temperature, expressed as cubic feet of air per pound of steam, the percentage of hydrogen was increased a definite amount and the specific gravity was correspondingly reduced. The degree of variation was naturally limited by the grade of fuel used; therefore, Chart I is indicative of the conditions present at that stage only.

As we became more familiar with the heavy oil process and had perfected new oil sprays we found that the air steam ratio and the thermal efficiency were quite useful in the technical control of our "make gas." Since the process is basically thermochemical I have plotted the thermal efficiency against the Conradson carbon of the oil used for the purpose of illustrating the constancy of this figure over a wide range of operating experience. Chart II shows that during our past seven years experience on oils of 2% to 14% Conradson carbon content, the thermal efficiency has dropped only from 84% to 82% while the set capacity has been reduced from 6500 M.c.f. to 4800 M.c.f. per set day.

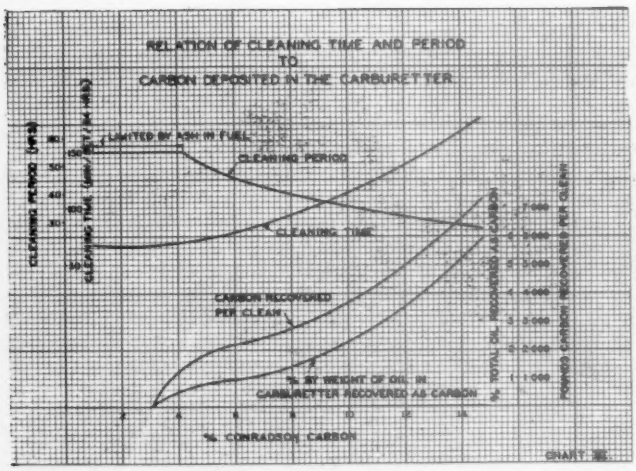
The cause of this 25% reduction in capacity is explained in Chart III. When we were operating with oils up to 3% or 4% Conradson carbon content we found that there was no carbon deposited in the carbureter. We therefore received the maximum possible set capacity for any one fuel as the ash in this fuel limited the cleaning period. However, as we progressed to oils with 4% to 14% Conradson carbon content the set capacity fell off rapidly and the carbon deposited in the carbureter increased proportionately. We then found that the chief factor limiting the set capacity was the relation between the time required to deposit the maximum allowable carbon in the carbureter and the time to remove it. For example, an oil of 12% Conradson carbon when 55% of the total oil is charged into the carbureter, would deposit 5000 pounds of carbon in this chamber in about 32 hours. For an 11 ft. carbureter this deposit would be about 24 inches thick and require about 140 minutes to remove. An additional obvious cause for the reduction in set capacity as the Conradson carbon increases is that oils of high carbon content usually have correspondingly low gasification yield.

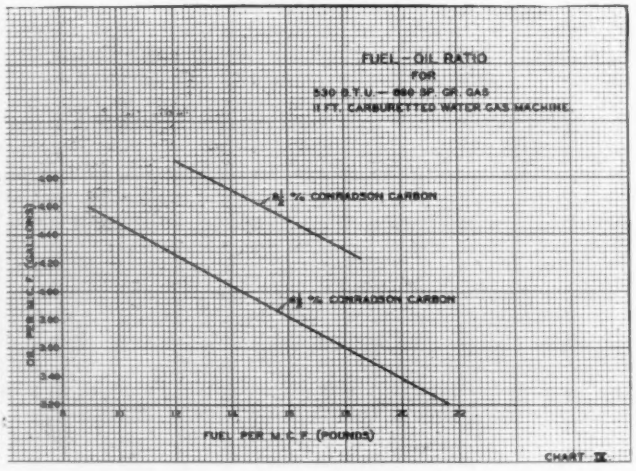
Any comparison of operating results even when confined to one plant is often quite difficult. During the seven years operating on heavy oils we have plotted our fuel-oil results to determine their trend. There are of course, too many variables which control these figures to be able to use only these results as a definite basis


TREND OF SPECIFIC GRAVITY OF BACK RUN GAS AS FIRE TEMPERATURE IS CHANGED
SPECIFIC GRAVITY
% HYDROGEN
AIR-STEAM RATIO
CHART I


THERMAL EFFICIENCY AND SET CAPACITY VS CONRADSON CARBON
11 FT. CARBURETTED WATER GAS MACHINE
530 B.T.U. — 0.650 SP. GR.
EFFICIENCY
SET CAPACITY
% CONRADSON CARBON
CHART II

Presented at American Gas Association Joint Committee of the Production and Chemical Committees, Hotel New Yorker, New York, May 24, 25 and 26, 1937.


RELATION OF CLEANING TIME AND PERIOD
TO
CARBON DEPOSITED IN THE CARBURETTER
LIMITED BY ASH IN FUEL
CLEANING PERIOD
CLEANING TIME
CARBON RECOVERED PER CLEAN
% BY WEIGHT OF OIL IN CARBURETTER RECOVERED AS CARBON
% CONRADSON CARBON
CHART III.

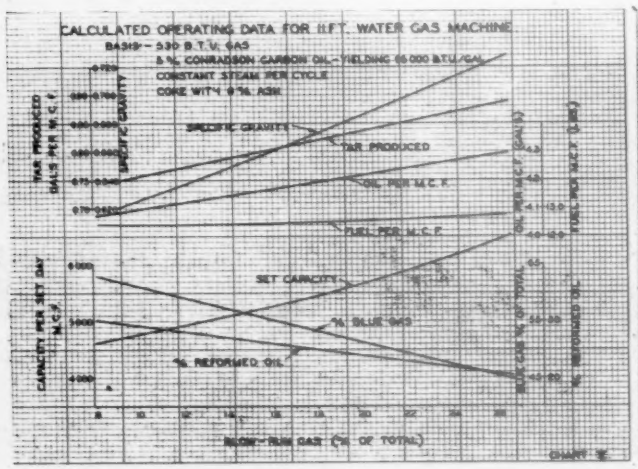

FUEL - OIL RATIO
FOR
530 B.T.U. — 660 SP. GR. GAS
11 FT. CARBURETTED WATER GAS MACHINE
4½ % CONRADSON CARBON
8½ % CONRADSON CARBON
FUEL PER M.C.F. (POUNDS)
CHART IV.

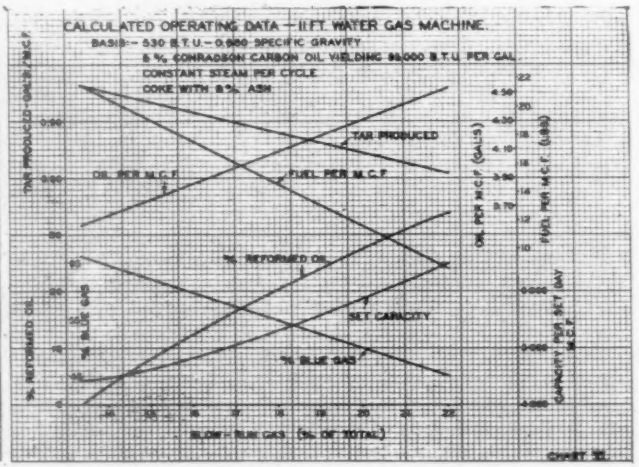
for plant control. However, this figure has proven a fairly reasonable basis for such control as long as we remained on one grade of oil and did not change the operating conditions beyond narrow limits. Chart IV indicates that for a plant operating within such limits, the fuel-oil ratio for an oil of about 4½% Conradson carbon (Curve B) and another oil of about 8½ Conradson carbon (Curve A) is approximately the same for both cases. The real discrepancy lies in the relative position of the two curves. We have not operated on intermediate oils long enough to obtain their fuel-oil ratio but it is reasonable to believe that they would fall in between these two curves.

As stated previously the supply of low gravity coal gas to our plant is quite an indefinite factor. It, therefore, becomes a definite duty of our operators to control the specific gravity of the "city gas" at the point of origin. In this plant our method of control has been to furnish the gas makers with a setting that would require them to make the minimum number of changes in the operating schedule. Chart V indicates the results for such a set of conditions which, for a constant Btu. gas, requires the gas maker to change only the blow run and oil cams on his automatic control. In this case as the percentage of blow run gas is increased we have a variation in specific gravity from 0.620 to 0.730. During this manipulation of blow run gas the blue gas and reformed oil percentage is decreased and the fuel and oil consumption is increased slightly. However, the increased fuel is compensated by an increased tar yield so that the thermal efficiency of the process remains constant. This method of operating has proven to be sufficiently flexible to satisfy all our demands.

Further proof of this flexibility has been shown in our plant as we are required to produce a gas of constant Btu. and specific gravity over wide ranges of capacity. The result of such a set of conditions is expressed in Chart VI which was calculated but was later substantiated by actual plant operation. Here we used a constant steam per cycle and varied the quantity of blow run gas and reformed oil, holding a constant thermal efficiency. From this type of chart we develop our emergency settings to be used for peak loads. For the condition as represented, Chart VI indicates that as the capacity and per cent of blow run gas are increased the per cent of blue gas in the mixture is decreased. At the higher capacities the low fuel per M.c.f. is obtained at the expense of the oil per M.c.f. and therefore the tar yield is low, thus holding the thermal efficiency to a constant figure.

Our experience with the heavy oil process has been necessarily limited to the manufacture of 530 Btu. gas. The results of our tests would indicate that the flexibility for any one set of conditions is subject to the carbon content of the oil. However, proper adjustment of the many known variables controlling the process should permit its use for the production of other gases differing in analyses and heating values. One has only to read the "Proceedings of the American Gas Association" to be satisfied that many companies are using or have used the Heavy Oil Process to produce high Btu. gases, thus giving further evidence of the flexibility of the process.


CALCULATED OPERATING DATA FOR 11 FT. WATER GAS MACHINE.
BASIS — 530 B.T.U. GAS
8 % CONRADSON CARBON OIL — YIELDING 95,000 B.T.U./GAL.
CONSTANT STEAM PER CYCLE
COKE WITH 9 % ASH
SPECIFIC GRAVITY
TAR PRODUCED
OIL PER M.C.F.
FUEL PER M.C.F.
SET CAPACITY
% BLUE GAS
% REFORMED OIL
BLOW-RUN GAS (% OF TOTAL)
CHART V.


CALCULATED OPERATING DATA — 11 FT. WATER GAS MACHINE.
BASIS — 530 B.T.U. — 0.660 SPECIFIC GRAVITY
8 % CONRADSON CARBON OIL YIELDING 95,000 B.T.U. PER GAL.
CONSTANT STEAM PER CYCLE
COKE WITH 8 % ASH
TAR PRODUCED
OIL PER M.C.F.
FUEL PER M.C.F.
% REFORMED OIL
% BLUE GAS
SET CAPACITY
BLOW-RUN GAS (% OF TOTAL)
CHART VI.

Above: **SKINNER SERVICE SADDLE. Note simplicity and strength!**

Right: **as installed on line.**

SKINNER SERVICE SADDLES make tight, rigid, lasting service connections . . . QUICKLY!

The only saddle having skids on lower half to absorb all movement when bolt pressure is applied — thus preventing tilting at the tap. SKINNER SERVICE SADDLES are widely used for service connections. Made of malleable iron with cadmium plated steel bolt. Lead gasket is riveted in place. Single large bolt saves time in application, and gives a uniform seating to the gasket. Each saddle accurately formed over a mandrel, then given a 50 lb. air-and-soap test before shipping. Write for prices, and complete catalog.

SKINNER SADDLE TEE, (at right) for installing gas appliances. No pipe cutting — no threading. Complete job in 3 minutes. Easily applied anywhere. Standard with hundreds of gas companies for installing Electrolux and other equipment. Write for prices.

M. B. SKINNER CO. *Est. 1898* SOUTH BEND, IND.

Proposed Combination of Blue Gas Production and Oil Cracking Process

E. A. Dieterle,
Consulting Gas Engineer, Chicago, Ill.

Leon J. Willien,
Chief Gas Engineer, Public Utility Engineering and Service Corp., Chicago, Ill.

STUDIES were made during the past year of various schemes to determine whether there was a method or process which held promise of materially reducing gas promotion costs. The following schemes were considered:

1. The complete gasification of gas coal in a carburetted blue gas machine with the recovery of all the volatile constituents liberated from the coal, in the finished gas. With present practice—using gas coal as generator fuel—about 58% of the volatile constituents of the coal is recovered in the finished gas.

2. The preheating of the generator and carbureter air—used in the manufacture of carburetted blue gas—up to 1000° F. It was believed that this would reduce the amount of generator fuel used.

3. The use of oxygen—
   (a) As a substitute for generator and carbureter air in the manufacture of carburetted blue gas.
   (b) With steam in a producer gas generator and enriching the resultant gas to the required heating value with butane.

4. The utilization of the heat generated in the manufacture of blue gas in an oil cracking plant—such as used by oil refineries—producing gasoline, coke and oil gas or residuum oil instead of coke.

As a result of these studies the following conclusions were drawn:

1. That instead of working toward complete gasification of the raw materials used in the manufacture of gas, gas companies should convert their gas plants into chemical plants and produce the maximum amounts of valuable by-products. This appears to have great possibilities of effecting a material reduction in gas production costs.

2. That utilizing the heat generated in the manufacture of blue gas in an oil cracking plant appears to have possibilities of materially reducing gas production costs.

Aside from companies operating coke oven plants—which recover and sell as many by-products as possible—the only gas company in the country that has converted its gas plant into a chemical plant and produces several by-products is the Portland Gas Light Company, Portland Oregon. This company manufactures a 550 Btu. oil gas by the Pacific Coast Oil Gas Process using the cheapest grade of oil available. The lampblack is briquetted and sold for domestic heating. Light oils are recovered from the gas as motor fuel. The tar is refined for road purposes. Recently they have developed a process for recovering sulphur from spent oxide in a marketable form. This company has been operating in this manner for years. It is fair to assume therefore that being in the by-product business must be profitable or they would not continue.

Instead of burning the producer gas, made during the blow, and heating the checker brick in the carbureter and superheater, why not burn it in a furnace of any of the well known oil cracking units and crack the oil the same as is done in an oil refinery? Heat is required to crack oil. In the manufacture of carburetted blue gas, it is produced as a by-product in the manufacture of blue gas. In oil refineries, either fuel oil or oil gas—by-products of the cracking processes—are used for generating the heat requirements.

Since approximately 10 gallons of gasoline will be produced per MCF of total gas made, its disposal at a reasonable price may be a real problem.

Due to variations in oil and gasoline prices in different sections of the country it would be impossible to submit any estimates on the net cost per MCF of gas produced by this scheme. Estimates have been made for one or two special locations in the middle west based upon the prevailing prices of fuel oil and gas oil and assuming that the gasoline can be sold at about a cent a gallon below the tank car price. These estimates showed:

1. That compared with water gas operation, a reduction of 50% in gas production cost may be possible.

2. That an annual gas production of 500 million cu. ft. or more is necessary.

Articles which follow abstracted from papers presented at Joint Conference of the Production and Chemical Committees, American Gas Association, New York, May 24-26, 1937.

Effect of Cyanogen—Organic Sulphur Upon the Stoppage Problem

By
E. J. Murphy & A. R. Bayer
The Brooklyn Union Gas Co.
Brooklyn, N. Y.

Summary

This paper deals with a study of cyanogen-organic sulphur in manufactured gas and its effect on the stoppage problem.

Needle valve stoppages on various kinds of appliances had come to be regarded as being caused by vapor phase gum. At least, in most cases, the Griess test indicated the presence of this substance. However, the presence of only .3 gram of nitric oxide in the gas at the holder outlet did not appear to justify the belief that vapor phase gum was the entire cause of the problem.

During an experiment with low surface tension solutions (wetting out agents) on their effect on wetting gum and dust particles, an observation was made which finally led to the discovery of the part played by certain organic sulphur compounds and cyanogen in the stoppage of needle valves. The experiment in question was carried on by passing gas through copper tubing and causing it to bubble through a low surface tension solution contained in a large mason jar. In a short space of time the copper became heavily coated with a dark tarnish

of greenish hue. As the rate of tarnish progressed, a dark brown substance was deposited in the mason jar.

Analyses made of the reaction products or deposits, proved to be a complex arrangement of copper, mercaptans and cyanogen. Parallel experiments with iron pipe as a bubbler produced similar results. Aluminum tubing gave no deposits of any kind.

Heating the iron and copper reaction products in air yielded nitrogen peroxide as detected by the Griess test. No other decomposition method gave the same results.

Synthetic reaction products of copper and iron were successfully produced in the laboratory, using various mercaptans and other forms of organic sulphur with cyanogen. These products showed the same characteristics as to form and yield of nitrogen peroxide on heating.

The effect of other "trace components" on reaction rates was studied. It was found that if ammonia were introduced even in very small quantities, the amount of reaction products was greatly increased. This catalytic effect by ammonia on the metal-cyanogen-organic sulphur system increased yields of approximately 200%.

The effect of carbon monoxide on the copper bubbler was nil; but the formation of considerable iron carbonyl was observed in the iron bubbler.

Analytical tests on deposits scraped from 240 brass needle valves removed from customers' premises were positive for cyanogen and organic sulphur. Heating evolved nitrogen oxides and carbon monoxide. All tests were negative as to the presence of gum. Steel, tinned or chrome-plated needle valves were entirely free of cyanogen-organic sulphur. Deposits occurring in these cases were liquid phase gum.

Needle Valve Complaints
July—1936—December

Metal	*Complaint No. Pilot Out*	*Complaint No. Pilot Too Low*
Brass	516	169
Steel	47	140
Aluminum ...	4	23
Chrome Plated	2	14

It was shown by analysis and synthesis that the effect of manufactured gas containing even small quantities of cyanogen and organic sulphur upon such metals as copper or iron can be regarded as a process of corrosion.

The data support the claim that many distribution disturbances, e.g., iron main and brass needle-valve deposits, are due to this process of corrosion.

Cyanogen corrosion as well as nitrogenous gum accumulation must be simultaneously considered for a fuller understanding of the stoppage problem.

Puzzle picture—How many faces can you find? You're right!—6. Left to right (seated) F. B. Parke, Brooklyn, N. Y.; S. A. Mills, Kearny, N. J., and A. H. Schaaf, Brooklyn, N. Y. certainly know how to pick out their background.

Center—Charles F. Turner, Cleveland, is "fogging" the view of Erick Larson, New York, (left). G. E. Ludwig of Grand Rapids wisely looks straight ahead.

Photos Courtesy American Gas Association

Crushed Coke Size as Affected by Coke Breeze Admixture to Coal Prior to Carbonization

F. J. Pfluke
Rochester Gas and Electric Corporation
Rochester, N. Y.

Conclusions:

1. We may therefore conclude that when coke is to be crushed, certain sizes and amounts of coke breeze may be converted into larger sizes by adding it to certain kinds of either blended or 100% high volatile coal.

2. The limit of size of breeze which may be added is minus ⅛".

3. The limit of amount is 4% of minus 1/32", 3% of minus 1/16" and 2% of minus ⅛".

4. Providing these limits are observed both with 100% high volatile coal and blended coal the percentage of salable or usable coke from the initial charge remains almost unchanged when breeze is added compared to the percentage of salable or usable coke from the initial charge with no breeze added.

Blending of Certain High-Volatile Coals With Beckley Bed Coal and the Effect on the Yield and Quality of Carbonization Products*

Joseph D. Davis[2] and Clarence R. Holmes[3]

Bureau of Mines Experiment Station
Pittsburgh, Pa.

Summary and Conclusions:

Tests were made in the 18-inch BM-AGA retort at 900° C. in which 20 and 30 per cent of Beckley low-volatile coal was blended with seven high-volatile A coals and with one high-volatile C coal. The yields and quality of products were determined and compared with those from 100 per cent charges of the constituent coals. Conclusions reached apply only to the particular samples of the coals in question; they are as follows:

1. The yields of products from blends cannot be calculated precisely from those from 100 per cent charges of the constituent coals. The calculated yields of gas and Btu. in gas per pound of coal, tend to run high, whereas the calculated yield of tar runs low, indicating less cracking in the blend tests.

2. The cokes from the blends were better than those for 100 per cent of the high-volatile coals, but the gain in quality of the coke on using 30 rather than 20 per cent of low-volatile is not always as great as would be expected. In one case, a 30 per cent blend produced almost as good coke as 100 per cent of the low-volatile coal. The plastic properties of the coals and blends line up fairly well with the quality of the cokes as measured by the shatter and tumbler tests, the agreement being best with the latter.

3. The blends yielded tars which were less cracked than those from the 100 per cent charges, probably because the tar from the low-volatile coal is less sensitive to temperature than tars from the high-volatile coals.

* *(Contribution from the Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.)*
[1] *Published by permission of the Director, U. S. Bureau of Mines. (Not subject to copyright.)*
[2] *Senior fuels chemist, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.*
[3] *Junior Chemical Engineer, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.*

Treatment of Holder Waters to Eliminate Paint Discoloration

John R. Skeen

The United Gas Improvement Co.
Philadelphia, Pa.

The aspect presented by a district station is largely dependent upon the condition of the paint on the equipment and the largest of all is the gas holder. The inside surfaces of lifts and tanks are not painted but those presented to the public are, partly for protection of the metal, but also to make them as presentable as may be. In the case of pressure and waterless holders, the painting problem is no more difficult than that of any other type of outdoor structure; but with respect to water sealed holders, the situation is entirely different and more involved. Thus in warm weather, often within a few weeks after thousands of dollars have been spent in freshly painting a holder, the lift sheets that have been immersed in the tank and cup waters are overlaid with a reddish-brown discoloration; in effect, repainted in a most unsightly manner.

The elimination of this discoloration originating from the holder water has been the concern of all gas companies.

A few palliatives have been developed in the past but no cure has been known, for the reason that there was no understanding of the cause. In 1934, the Research Department of The United Gas Improvement Company undertook to establish the cause and, if possible, to provide a cure. In addition to hundreds of laboratory tests, six commercial holders have been used in large scale experimentation. The necessity arose of bridging the huge gap between tests in 50 gallon drums and the treatment of 6 million gallons of water. As will be shown, the result of the work is a water treating process which eliminates lift discoloration in water-sealed holders and, incidentally, reduces corrosion at a nominal cost in view of the large volumes of water involved.

The cause of holder discoloration has been demonstrated to be due to an iron-organic complex consisting of iron oxide distributed throughout organic debris. The debris is derived from the growth and death of a type of "iron bacterium" belonging to the group of Trichobacteria.

Holder discoloration may be eliminated at a low cost by the use of sodium bicarbonate and sodium dichromate dissolved in the tank water in carefully chosen concentrations.

Since the absence of discoloration reveals paint defects otherwise concealed, a necessary corollary of discoloration control has been the development of improved paints for water immersion.

Southern Natural Gas Co. Takes Over Six Distribution Systems

The Southern Natural Gas Company, of Birmingham, Ala., has purchased control of the Alabama Gas Company's distribution systems in six cities, including Montgomery, Selma, Tuscaloosa, Anniston, Gadsden, and Decatur.

The transaction was approved by the National Securities Commission in Washington. The Southern Natural also bought the outstanding securities of the Huntsville Gas Company and will operate it with the former properties of the Alabama Gas Company.

William Gignilliat, vice-president of the Southern Natural, announced that J. W. Gates, for the past five years manager of the Alabama Gas Company's system, had become vice-president and general manager of the company under the new ownership. Mr. Gates, whose office has been in Mobile, will have an office in Birmingham. The Mobile Gas Service Corporation was not included in the transaction.

Until recently the Alabama Gas Company was known as the Alabama Utilities Service Company.

The New England Gas Association

At their last meeting, the directors of the New England Gas Association voted to hold the next annual meeting on Thursday, February 24, and Friday, February 25, 1938, at the Hotel Statler, Boston. It is planned to have the same sessions as this year—business sessions on Thursday and Friday, a dinner and dance on Thursday evening and a Home Service luncheon Friday noon.

The Benefits of Employee Selling to the Employee and the Company

By
S. B. Severson
Vice-President and General Manager
Republic Light, Heat & Power Company, Inc., Buffalo, N. Y.

A FAMOUS axiom of geometry states "the whole is equal to the sum of its parts." In like manner in business, a company is equal to the sum of its employees, and the affairs of the company prosper or decline in proportion to the success or failure of the affairs of the employees comprising it. Since this is the case, management weighs and considers carefully all activities affecting its employees. Management asks the sponsor of such an activity, "Will it benefit my employees and through them my company?" "Will it offer them new opportunities for advancement and increased earnings?" "Will it furnish new experiences which give them a broader conception of their job and its relation to their company?"

We believe that a sound plan for employee participation in selling activities of an organization definitely benefits the employee and the company. We believe that such a plan offers new opportunities for his talents, develops his latent talents, increases his income, opens the way for advancements and makes his everyday work more enjoyable. We believe that it affords him new experiences, new responsibilities and a new conception of his company. This belief is the result of almost a decade of experience in employee sales participation as practiced very successfully by a group of gas companies serving over 85,000 customers in western New York and the Province of Ontario, Canada.

Let us take for example the matter of new opportunities which our plan has opened up for our individual employees and how it has offered him a new field for his talents, helped him to develop those talents and as a result increased his earnings. In the first place, his successful participation in employee selling has opened up jobs for him in the regular sales department. I could cite instance after instance where former operating employees such as townsmen, distribution men, clerks, cashiers and engineers, having tasted the fruits of selling through our "tip" or "direct" selling activities, have accepted regular selling jobs when offered them. In these jobs they capitalized on their talents developed under employee selling and thereby increased their earning power. During the past two years at least 25 men or approximately 50% of the added personnel to our regular sales force were recruited from our operating employees.

Employee Selling from a Former Operator's Viewpoint

As an outstanding example of how one operating employee discovered and developed his latent talent for selling, I have in mind one of our most successful salesmen, in fact, our ace salesman for the past year. This man, but a few years ago was a general townman in one of our smaller distribution centers and had been so employed for a long time. Listen to his own words as he writes what our employee selling plan has done for him. He says:

"It gives me a great deal of pleasure to give you my thoughts on Employee Selling. The extra money earned by me through employee participation is of minor importance as compared with the confidence which I have built up in myself.

"Had it not been for employee selling, I am quite sure that I would not now be a member of the sales force, because I would still be of the opinion that I could not make good at it. This can best be proven in my case by the fact that after making a fairly good showing in a different type of selling campaign in the year 1925, I was offered a position in the Sales Department. I declined this offer only because I was afraid to try it. My sales efforts up to that time had been so limited as not to be convincing to me. By inaugurating Employee Selling, I believe our company has offered its employees a valuable opportunity. It is there for those who will take it.

"I tried it and really surprised myself—the more appliances I sold, the more confidence I gained—the job became easier. I definitely sold myself on the idea that when I sold an appliance to a customer, he was more of a gainer on the transaction than I was.

"Having this in mind, why should I hesitate to approach even the most important men in town,—and so it became possible for me to meet people on their own ground.

"If I were leaving the company as I write this letter, I would feel that I had reason to thank them for the opportunity afforded me, which extended my field of endeavor, enabled me to gain valuable experience and placed me in a better position to compete with the labor market than I was when they first took me into their employ. . . ."

That statement is but one of many which bear out the soundness of our plan of employee selling in offering new avenues of advancement and increased earning power to our operating men through becoming regular sales representatives.

Thus, the employee has benefited and furthermore, it has been our experience that this recruiting of sales representatives from the ranks of our successful operating employees has benefited our sales supervisors and the company. This selective picking of our regular sales force has produced salesmen who are consistent producers. This eliminates that usual period of adjustment that it takes a new salesman to become familiar with a company's operation, its product, policies and customers. In addition, we have found that having had operating experience, the salesman is appreciative of the physical features of the appliances and the operating problems involved. He is thus better equipped to serve our customers by selling them the type of appliance best suited for their needs. Compare this selected employee from our ranks with the usual method of hiring salesmen

Presented at Convention of Natural Gas Department of American Gas Assn., Kansas City, Mo., May 10-15, 1937.

PAVING THE WAY TO

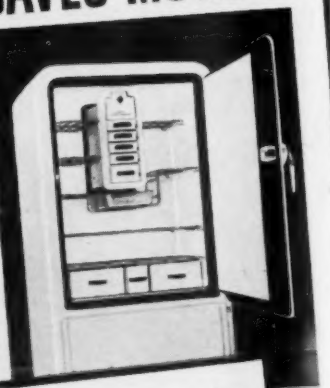
FROM HOLLYWOOD TO BORNEO ITS SILENCE SAVES MONEY!

1

SERVEL ELECTROLUX

owners acclaim the thrifty, dependable performance of this modern refrigerator whose freezing system

HAS NO MOVING PARTS



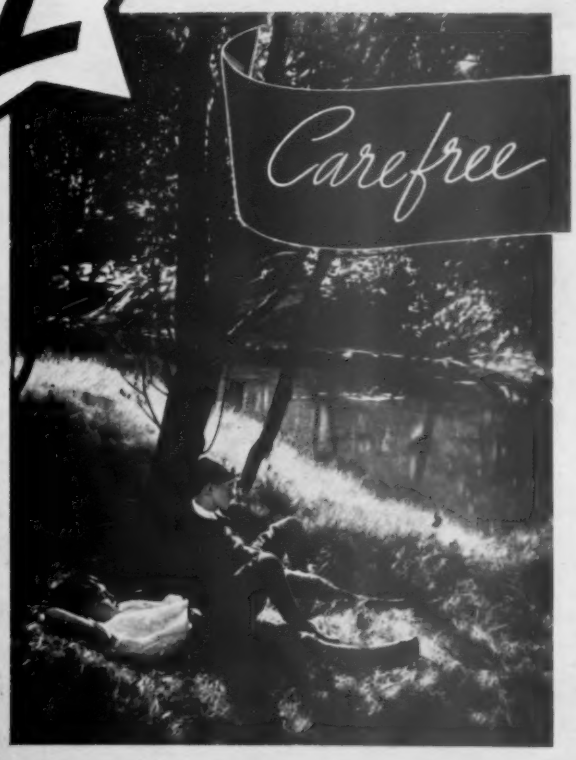
3

YOU'LL SAVE MORE MONEY

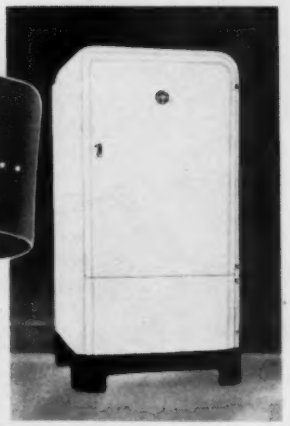
because it's silent, different freezing system HAS NO MOVING PARTS

WITH A SERVEL ELECTROLUX

2



silence...



SERVEL ELECTROLUX

IS SILENT AND CAREFREE

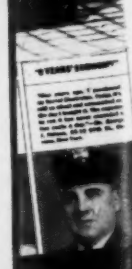
BECAUSE ITS FREEZING SYSTEM

HAS NO MOVING PARTS

Start now to enjoy its matchless benefits . . . its lasting savings

SERVEL ELECTROLUX

THE *Gas* REFRIGERATOR



EE IT AT
GAS COMPANY
OCAL DEALER

ONEW SALES PEAKS!

THIS MONTH, SERVEL ELECTROLUX ADVERTISING WILL REACH MORE THAN 23,000,000 PEOPLE . . . will win new prospects for GAS AND GAS REFRIGERATION

GAS REFRIGERATION SALES ARE BOOMING!

In the first few months of this year, all previous Servel Electrolux records have been smashed. For example, in April, 10,620 gas refrigerators were sold in Greater New York alone. Similar stories of success pour in from every section of the country.

Servel Electrolux is supporting you with the biggest promotion campaign ever run on a gas appliance. Magazine advertising is reaching more than 23,000,000 people a month. Radio's greatest dramatic show—"The March of Time"—is reaching more millions every week.

1937 is a gas refrigeration year! Are you on the bandwagon? Are you following these fundamental steps to peak business? **(1)** Display new Servel Electrolux models prominently in your window and on the floor of your showroom. **(2)** Tie in with the magazine campaigns by advertising in your local papers. **(3)** Send out literature about this different refrigerator. **(4)** Use poster displays on your local highways. **(5)** Utilize the backs of gas bills for "reminder" advertisements.

Servel, Inc., Servel Electrolux Refrigerator, Sales Division, Evansville, Indiana.

---

1 **"FROM HOLLYWOOD TO BORNEO, ITS SILENCE SAVES MONEY"**—arresting headline, interesting pictures, and straightforward copy characterize this advertisement in Servel Electrolux's tabloid series. This will reach a total of 13,458,679 readers during June, running in "Collier's," "Liberty," "Good Housekeeping," "True Story," "American Magazine," "Better Homes and Gardens" and "American Home."

2 Another in the series of attractive institutional advertisements, carrying the headline: **"CAREFREE SILENCE."** This will run in June as a two-page spread in "The Saturday Evening Post," and as a single page in "Time," reaching 3,584,994 readers altogether. Like its predecessors, this advertisement combines striking illustration, terse copy and impressive testimonials.

3 In June, the Servel Electrolux advertisement in "American Weekly" will be a full-page, four-color smash, with the powerful headline: **"YOU'LL SAVE MORE MONEY WITH A SERVEL ELECTROLUX."** Hard-hitting, aggressive in treatment, this dramatic advertisement will drive home to 6,000,000 readers the benefits of gas refrigeration and will capitalize the interest created by the editorial-type advertisements that have preceded it in this publication.

SERVEL ELECTROLUX

THE *Gas* REFRIGERATOR

based on his record established with other company's selling, unlike products, and under different selling policies. The latter method results in loss in time and sales, while the salesman is becoming familiar with the company's product, policies and territory. Very often due to the time factor involved and low sales, he becomes discouraged and desires a change in employment with a resultant turnover in the regular sales force, which cannot help but disrupt consistent sales production. These conditions furthermore, produce dissatisfaction among the other members of the selling organization.

Employee Selling from a Sales Supervisor's Viewpoint

I am reminded of the experience of one of our most successful sales supervisors, a former operator who had an excellent chance to compare the training of such men during a period when we had just started recruiting our salesmen from our operating staff. The occasion demanded more men than we could profitably spare from our operating department and accordingly several outsiders were also employed. This sales supervisor writes thus concerning those men not formerly operators.

"This very act of trying to acquaint men without any previous experience with gas appliances will be interesting to you. I, due to my operating experience, have been able to sell gas equipment because I know its physical features and what it will do for the customer because of these features. These men are greatly handicapped in not fully appreciating just what these features are. Had they actually worked as fitters, as members of the operating force, and engaged in some employee selling, I believe they could speak with more conviction when they actually started their sales career."

In contrast to this we have found by reasons of former operating employee's consistent record of success for a long period of time under year-'round circumstances that once transferred to the regular sales force, he will continue to produce sales without loss of time and will become a satisfied member of our selling organization. This, I can assure you, has been the record in the majority of cases in our properties.

In addition to opening up opportunities for employment in the regular sales force, we have found that through our employee selling plan, the employee has set himself on record in the eyes of management as being capable of successfully engaging in other types of work than that in which he is regularly employed. This has led to new experiences on his part in other operating phases of the business wherein he can assume more responsibility and having proved himself, has led to advancement on his part.

Employee Selling Opens New Opportunities

I am reminded of two different incidents bearing out this statement which occurred within the last year within our properties. The first case was the negotiation for the purchase of a rundown municipally owned distribution system and the obtainment of its franchise for the serving of natural gas in preference to other competitive fuels. It was a job that, after preliminary negotiations, broke suddenly and meant an aggressive campaign on the company's part to inform the citizens of the community of the advantages of natural gas over the other forms of competition. It further meant the canvassing of voters and the selling of the company and its product to them in preference to the competing type of service. Furthermore, it was a job that had to be done quickly, efficiently and without time for too extensive preparation.

Inasmuch as one of the major objectives of the campaign was the canvassing of the voters, the telling of the story of our company and the advantages of natural gas we wanted men who could combine the attributes of both salesman and operator. We checked the records of our successful operating employee salesmen and then picked several men and sent them to the town in question. Once there, these men began canvassing and telling the story of natural gas and our company and supervising other employees in the same type of work. The results proved the wisdom of this part of the plan as the franchise was granted by an overwhelming vote. Without this corps of sales-minded employees, trained in meeting and dealing with people and familiar with company operations, we do not feel that we could have accomplished this job as efficiently, smoothly and in the time provided.

Furthermore, once the franchise was secured, these men remained on the job and assisted in the adaptation of the system to natural gas. As operators, accustomed to the handling of materials, they assisted in the laying of new lines, the adjusting of appliances and other necessary adaptation work. As operator-salesmen, accustomed to dealing with people, they were able to make the change over work in a very satisfactory manner both to the customer and the company as newspaper testimony has verified.

The individual employees who participated in this work proved themselves capable of assuming new responsibilities and several of them since that incident have advanced in their own departments upon their return to their own communities. One of such men—a meter reader and collector, said:

"Regarding my experience in that town, I know that without the benefits accrued in our sales campaigns, I would not have had as successful a venture as it proved to be."

I believe it is hardly necessary for me to tell you what that incident meant to the company. In addition to the time and money saving manner in which the work was carried out, it also resulted in a canvass of a potential load which will be instrumental in building up that property. As a result of their training in "tip" and "direct" selling these men were conscious of sales possibilities and were able to transmit that knowledge in the most useful form.

Compare this effective method of quickly selecting trained men for the particular job when the occasion demands speed with the usual method of picking men from without the organization, and the resultant expense in training them for the task at hand. But, where can we secure trained operators with successful selling records and save this unnecessary expense and loss in time unless we have a sound plan of sales participation open to all employees which will give our operators sales training?

The second situation I made reference to was dissimilar from the first, but again demonstrated the value of trained operators with selling experience in undertaking new jobs. One of our companies planned to construct 132 miles of pipe line from a new producing area to our system. To accomplish this it was necessary to obtain franchises and rights of way in a very short time so that the line could be laid and gas brought to the distributing centers before fall and winter weather set in. Once again in selecting our men to do this important job, we kept in mind that this, too, was really a selling idea and accordingly picked men for our particular section of the line who had made some record as individual salesmen or as a captain of one of our

employee selling teams. Again the results were extremely satisfactory as the work was practically completed in little over a month's time.

One of these men was kept on to do most of the curative work of getting the permits extra hard to secure and adjusting damage and roddage claims. He was very successful in completing this work with very satisfactory results both to the claimant and the company. After this experience he wrote this:

"I do believe the experience I have had in trying to sell has helped me many times in my other work, such as buying leases, securing rights of way and settling damage claims. It has made it easier for me to approach people and to get them interested enough so that they are willing to accept the proposition I have to offer."

Again the value of that experience to the company is obvious. All the necessary work was accomplished without delay and the usual extra expenses in bringing outsiders into a company and training them. At the same time, the company had a further proving ground to test the ability of certain of its employees to assume new responsibilities and carry them through to a successful conclusion.

A Successful Plan of Employee Selling

At this point you may naturally ask what is the nature of our plan of employee selling which has produced such excellent results over a period of years. The complete plan with few minor changes to meet new conditions is already available in a paper[1] presented before the Natural Gas Department two years ago in Memphis and a second one[2] read before the Technical Section of the American Gas Association at Chicago in 1935. These two papers give in detail our entire employee organization both for "tip" and "direct" selling. In addition they comment in detail on its history, and contain statistical records of its accomplishments.

We believe its success lies in its complete coverage of all phases of operation, its gradual development from "tip" selling to "direct" selling, its recognition that as the operators engaged in more selling activities, they needed further sales training. This was provided by an investment in a course of salesmanship for all employees. This course was given by our own men trained by an organization which has achieved a national reputation for courses in basic selling fundamentals.

Two other factors, we believe, have been largely responsible for its continued success. The first has been that the management supported and encouraged these activities and kept a watchful eye on all phases of its operation. The second was that from its inception it was based on the premise that employee selling was a good business proposition and as such its rewards should be paid as business success is paid, in cash. We believe that our cash commission plan has been instrumental in initiating and sustaining throughout these years interest in all phases of our employee selling.

As we reviewed our employee selling activities in all its phases in preparation for this paper we could not help but come to the conclusion that it has made a very tangible contribution to the life of the individual employee. As has been pointed out, it has opened up new jobs for him, either in the regular sales force or in other phases of operation. It has offered him an opportunity to develop latent talents, provided a means to express those talents, given him a chance to record his achievements in the eyes of the management, increased his earnings and made his work more enjoyable.

In turn, the company has also benefited through having trained men available instantly to undertake almost any kind of job which may arise. These men have proved themselves capable of dealing with people and handling situations. Appliance sales from employee "direct" or "tip" selling have continued to increase, amounting to $195,000 for the past year as compared with $152,000 for the previous year. We have found that in the face of an increased sales force and better business conditions, the proportion of employee selling has remained around 30% of the total sales.

Finally we cannot help but believe, as our experiences recorded in this and prior statements bear out, the truth a prominent executive of our company once stated when he said:

"If you make a marked success as a salesman, there is hardly a job that you would afterward tackle that you could not finish successfully on account of the experiences you have gained in the field of salesmanship."

This has been our experience in employee selling.

[1] *Severson, S. B. "Whole Organization Attention to Sales," Natural Gas Department. American Gas Association 1935.*

[2] *Severson, S. B. "Employee Selling from an Operator's Viewpoint," Technical Section. American Gas Association 1935.*

Illuminated Model Kitchen Display

Designed for use in show windows, on counters and other interior locations, an attractive and effective illuminated kitchen display for sales rooms is available through the Promotion Department of American Gas Association.

This illuminated sign, measuring 14¼ by 12¼ inches, gives a three dimension effect in full color, is set in a walnut finish frame with shadow box and connections for any 110 volt circuit.

A special photographic process gives this display actual depth and realistic perspective.

MAGIC CHEF

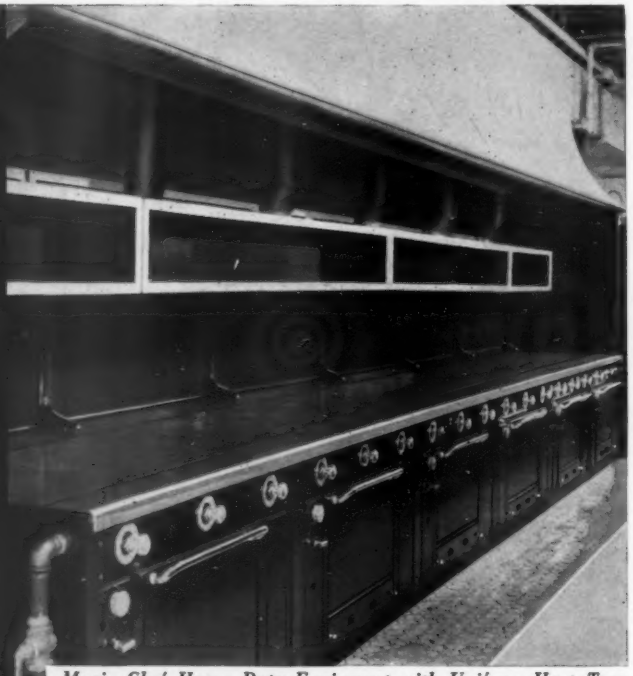
UNIFORM HEAT TOP

FAST TOP COOKING

SUBSTANTIAL GAS SAVINGS

UNIFORM HEAT CONTROL

INCREASED CAPACITY



Magic Chef Heavy Duty Equipment with Uniform Heat Tops in the main restaurant of Marshall Field & Co., Chicago.

MODERN restaurants, hotels and institutions favor Magic Chef Heavy Duty equipment because it is designed and built to meet present-day requirements of speed, economy, cooking capacity and flexibility. ● The Uniform Heat Top provides a fast top cooking area with accurate uniform heat over the entire top cooking surface of the Magic Chef Heavy Duty gas range. ● The Top Heat Control is simple, positive and accurate. Top burners light automatically when gas is turned on. Any desired degree of heat can be secured readily by a mere turn of the graduated dial. ● If you are interested in faster, better, more economical cooking, write for details.

The contents of four large kettles can be cooked at the same time on one 32-inch unit at fast, medium or slow heat or at varied temperatures on each cooking plate, if desired. Four center fire ranges would be required to do the same amount of fast cooking in the same time and temperature.

The heat is positive and satisfactory because it is even all over the entire cooking surface while on center, front and side fire tops the heat is graduated from high to low temperatures.

AMERICAN STOVE COMPANY

BOSTON • NEW YORK • ATLANTA ○ CLEVELAND • CHICAGO
ST. LOUIS • PHILADELPHIA ○ SAN FRANCISCO • LOS ANGELES

Magic Chef
AMERICAN STOVE COMPANY

LOOK FOR THE RED WHEEL WHEN YOU BUY A MAGIC CHEF

MAGIC CHEF HEAVY DUTY *Automatic Equipment* **FOR MODERN GAS COOKING**

Management's Customer Relations Job

By
Blackwell Newhall
Assistant to the President
The Philadelphia Gas Works Company

Photo Hollander & Feldman

BLACKWELL NEWHALL

IT is always well to start out with a clear, mutual understanding of what we are talking about, and to my mind, good customer relations seem to be no more and no less than "good human relations."

There is no argument with the statement that Customer Relations are intangible. They can't be seen, metered, felt, or put in a holder but without them all the combined efforts of the various departments are useless. I have a friend who likes to say that each of his employees has a package to deliver each day. Fine. But suppose customers are resentful or antagonistic. What good is the work of preparing the package if the customer decides to change to another fuel and doesn't want the package? Public Relations see to it that the prospective customer has heard good things of the company, then see that he is "kept sweet" while on the mains. This clearly throws the customer relations problem in the lap of each and every employee. It cannot be segregated from his regular duty of "delivering the daily package."

Just the other day, I read an interesting article in "The Lamp," the Standard Oil of New Jersey magazine. Some one had written to the company asking the name of the man who handles their public relations, and the answer was: "No one 'handles' our public relations. We do not regard them as something that can be segregated, departmented, assigned floor space and dismissed as a job. Public relations, good or bad, exist. You have them whether you like it or not. They are not taken on or discarded, willy-nilly. They are the result of many influences, and so are never fixed. Thus they reflect the composite public mind at the moment as it views an individual or a company from its experience or from hearsay."

Also, W. J. Cameron, on the Ford Sunday Evening Hour of February 14th of this year said: "The Ford Motor Company has no public relations department and employs no public relations counsel or 'spokesman.'" His conclusion was that "the best possible public relations counsel any business can have is *the head of the business* who is determined that right principles shall run through every relation of the business."

It is the head man of a company who will determine whether sensitiveness to costs or to customer reactions is to be the controlling factor in the conduct of the business. We all know of cases where responsible persons in companies have failed to live up to a promise to a customer when they found that their costs were to be increased and their record for economical operation was to be hazarded. Naturally, nobody desires that a customer should be allowed to impose upon the company, but it is vital that management express a desire that every employee of the company shall stand back of a promise made by an official representative of the company and not try to squirm after it is found that the promise is difficult to live up to. If, on review by higher authority, it is concluded that the promise was unwise, it should not affect the carrying out of the promise between the customer and the company, but rather should the matter be discussed with the employee and his error explained to him to prevent repetition.

Among the many things Mr. Newhall's article brings to mind is that frequently quoted phrase:—"A man is known by the company he keeps, and the Company is known by the men it keeps"—Ed.

Today the consciousness of people to conditions around them makes management's customer relations job doubly important. Take, for instance, the use of the radio. By this means, people are interested in and becoming acquainted with all types of social problems. Speedy transportation, moving pictures, and thousands of modern inventions, have provided greater stimulation to individuals to resent any seeming lack of willingness to serve on the part of utilities, or absence of humanness in dealing with them as customers. So many companies are careful of their public relations that being negligent of them can be a glaring example of laxity.

A special series of reports on current business opportunities, problems, and trends of outstanding significance was recently inaugurated by the magazine "Business Week," and it is interesting to note that No. 1 of this series was entitled "Public Relations—First in the Order of Business."

One important point made in this article is the recognition that the business leader of the future must be grounded in public relations. Hence, Princeton and other universities now have courses in "public relations management."

Here's a thought—just review in your mind how much literature passed over your desk last month on Public Relations. There is such a general relaization of its importance that perhaps some of us are getting "water logged." Perhaps it's time to boil it down to fundamentals again.

Continuity

It is important that our Public Relations should not be attended to haphazardly or spasmodically but should be a year-round every day job. The management which forgets this activity until something is wanted from the public, or it wants to put into practice a new policy and then

Paper presented at meeting of Penna. Gas Assn., Skytop, Pa., May 4-6, 1937.

realizes that it is out of touch with the public and must feverishly get into action, will surely lose out in the end. The public can't be fooled, especially when they are watching such matters so closely. We are, each of us, very careful in attempting to keep the high regard of friends and neighbors. Are we just as careful of what they think of our company?

There is a tendency today to resent corporations merely because there has been a lot of talk against their size without much discussion of the benefits which resulted from these consolidations. Customers were perhaps permitted to feel that they were merely regarded as impersonal accounts, and this attitude was ammunition in the hands of the opposition.

Let us for a moment liken ourselves to a small one-man business in a small community. Everybody in the town knows that man in both a social and a business way and everybody probably knows all about his business. The town folk would understand the necessity for changes in prices and other matters because he would probably discuss it with many of them. For the large public utility, or any large business, the closer that idea can be carried out the better the corporation will stand in the community.

Alfred T. Sloan says: "It is recognized that the corporation's most vital relationship is with the public, and its success depends on a correct interpretation of the public's needs and viewpoint, as well as on the public's understanding of the motives that actuate the corporation in everything it does."

The Friendly Attitude

We are, therefore, faced with the job of telling our story and selling ourselves to the public. No matter whether we tell the story on the radio, in the newspapers, or in periodical releases, let us tell it in a friendly fashion, in language that we know our customers will understand. There is the danger of speaking in technicalities and thus losing the point we are trying to make in a mass of words that mean almost nothing to the average citizen.

The March issue of "The Atlantic Monthly" contained an article entitled "The Job Ahead," explaining what industry as a whole must do to earn the confidence and allegiance of the people. It stated, among other things,—"Nowadays the role of the strong silent man is of doubtful wisdom, so rare is the discrimination which can distinguish being silent from simply being dumb."

One of the best illustrations of wide-spread public relations activities is the periodical "fireside chat" indulged in by various high officials in the Government. Whether you like the subject matter or not, you must admit that these talks are couched in simple words and have a direct appeal to the average citizen.

While management has little opportunity to come in personal contact with many of its customers, this is no excuse for its not keeping a finger on the pulse of these people. In this connection, management should make itself readily accessible by telephone or personal visit; it shouldn't be too difficult for a customer to find his way to the head office.

Naturally, the average representative of management makes a great many contacts in the course of his business life, but it is usually with other leaders of the community and he has scant opportunity of meeting any of the great mass of customers. Ergo—it is the average employee who has our fate in his hands. He makes the contact. How has he been trained? Training contains the very essense of public relations. Good and bad, it makes itself evident frequently. Just the other day, while crossing a busy intersection, I saw a truck come to a screaming stop against a red light, causing the pedestrians to jump. The company owning the truck has its name all over it but had neglected to train its drivers.

Most of us subscribe heartily to the principle that customer good-will can be developed only on a firm foundation of employee good-will.

On the other hand, Anthony Adverse represents an excellent case of *good* business training. Just think of the thoroughness with which Grandfather Bonnyfeather taught Anthony the policies and details of the business.

Employee's Enthusiasm

Important opportunities exist for employees to build public good-will outside of the routine activities of those who normally contact our customers. To this end, a rather comprehensive training program should be carried on for *all* employees, covering not only a knowledge of the company, its services, and the appliances it sells, but also effective methods of imparting this information to their friends and everyday acquaintances.

The president of one of New England's Gas Companies stated recently that the first and most essential fact in good public relations is a contented and enthusiastic personnel from the officers way down through all the rank and file.

Probably most of us subscribe heartily to the principle that *customer* good-will can be developed only upon a firm foundation of *employee* good-will. Consequently, we are constantly scrutinizing our entire employee-relations programs for possible points of improvement.

(1) Fix a Public Relations Policy

In establishing a satisfactory public relations set-up the first thing management must do is to decide what the general policy on public relations is to be. How many of us could briefly and clearly state our company's policy to a customer, or even to a fellow employee? Here is a suggested policy—give the maximum of service to each and every customer with minimum cost and required effort on the customer's part. This last is important. The required effort on the part of the customer in any and all contacts must be kept at a minimum. Do we always think of this?

(2) Determine the Public Relations Factors in Your Company

Having fixed the public relations policy, the next step is to determine who is going to be in charge of this work and the public relations factors. Is it to be the function of all department heads or is it to be a special public relations department? It makes very little difference as far as the public is concerned, since every employee is a public relations man himself.

We had a striking example of this very thing the other day. A woman having a grievance of long standing against the company suddenly wrote to us in a friendly fashion. The change in her attitude was on account of the good workmanship and friendly contact made by one of our service men. She explained that he alone was the cause for her new point of view.

Here's another angle. Management must keep an eye out for practices which may offend customers indirectly. For instance, buying in quantity by employees, thus hurting merchants. Recently, I heard of a case where a large coffee merchant

FOUND! Thousands of New Prospects for Gas Water Heating . . . with the

AMERICAN-BOSCH No-Tank WATER HEATER

• FOR THE HOME

Small homes, summer cottages, "cold-water" houses and apartments will bless the American-Bosch No-Tank Water Heater . . . and the *low-cost* hot water it makes possible.

• FOR BARBER SHOPS

The capacity of the American-Bosch No-Tank Water Heater is ample even for the requirements of busy barber shops.

• FOR BEAUTY SHOPS

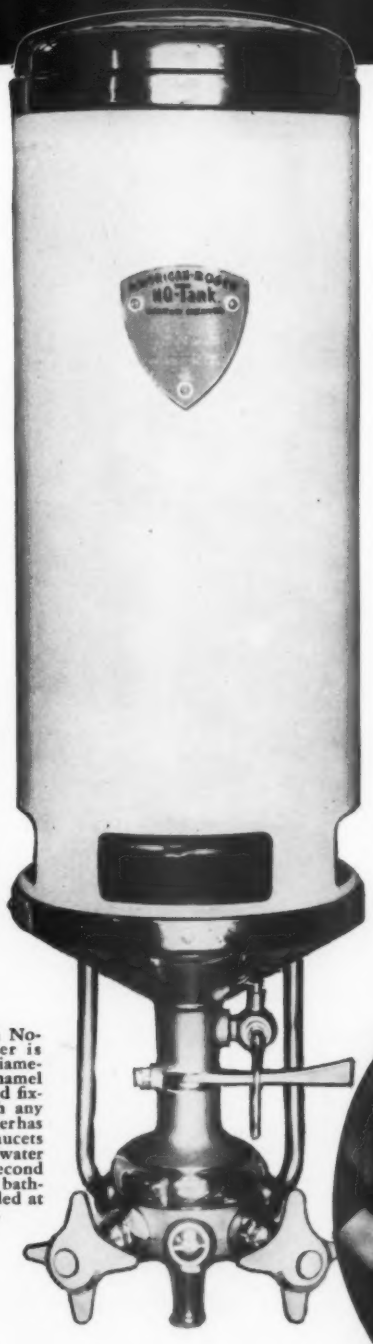
Two outlets can be supplied, if desired, from the same "No-Tank" Heater . . . a feature of special value to beauty shops.

• FOR FILLING STATIONS

Customers using the rest rooms appreciate the extra courtesy of hot water. It helps keep attendants looking clean, besides.

• ALSO:

For doctors' and dentists' offices . . . business offices . . . drug store fountains . . . domestic science classes . . . laboratories . . . anywhere and everywhere that hot water is needed . . . AT A PRICE.



The American-Bosch No-Tank Water Heater is 23¼" high, 6¼" in diameter. Gleaming white enamel finish or chrome plated fixtures harmonize with any modern kitchen. Heater has hot and cold water faucets so that temperature of water can be adjusted. A second outlet (such as in bathroom) can be provided at slight additional cost.

WHEN you can promise hot water at the turn of a faucet...without expensive equipment in the cellar ...without a tank in the kitchen...and at modest first cost, installation and upkeep...*you've got something*—

—something that extends the benefits of automatic hot water to additional thousands in your community.

—something that opens up hitherto closed markets among simpler homes and apartments, and smaller commercial installations.

—something that will prove a permanently effective load builder.

The new American-Bosch No-Tank Water Heater heats water instantaneously, automatically at the turn of the faucet... ¾ of a gallon per minute. No waiting...no waste.

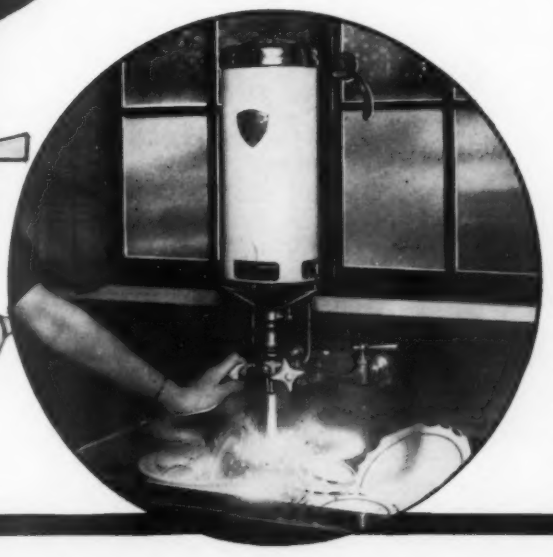
And installation is extremely simple, it being only necessary to attach the heater in place of the cold water faucet and connect the gas line!

The American-Bosch No-Tank Water Heater, along with the American-Bosch Konverto, Kabinette and Ball-Tank Water Heaters, gives gas companies a complete, practical, profitable line to meet almost every domestic water heating need. Write for complete information and literature.

Gas Appliance Division

UNITED AMERICAN BOSCH CORPORATION

SPRINGFIELD, MASS. New York Chicago Boston Pittsburgh



The makers of American-Bosch products have always taken pride in creating, designing, building and selling products superior to those commonly in use. Built to a high standard of quality, these products are proven leaders in their fields.

who uses gas as a fuel for roasting coffee was disturbed through gas company employees innocently buying coffee at wholesale from a competitor. The gas company thus became one of the largest coffee retailers in the town. Just a thoughtless activity to save a few pennies for the employees and yet very offensive to a large customer—our "bread and butter."

It has proved to be a good idea for each department head to have his key men prepare for him a statement of the public relations function of that particular group. From this, management can get the reaction and thoughts of those doing the job. These factors should be weighed and a decision made as to the ones that should be stressed, then a sampling of each of these types of contacts should be made. Management should take time to review thoroughly all details of each type of public contact.

Another method is to review the policies of the various departments that deal with the public to see if there is any conflict; any waste motion. Feeling certain our policy is right, we should check to see how well the employees understand it. By this I mean the contact employee —the person who fires the gun.

Every company has one or two employees who are striking examples of how not to conduct public relations. They believe that excess courtesy should be shown when talking to a customer, but all consideration is removed when talking to employees. Inside contacts should be made with care as well as those on the outside, because an excited or upset employee is a liability. One cannot mechanically shut off feelings aroused by an argument with a fellow employee. The customer who is contacted a few minutes later is bound to bear the brunt of this emotional hangover.

Management should have a public relations representative as the person to contact newspaper and radio people in case of an unforeseen event. It is essential that the company's side of the situation appears at the same time the other side is printed or told. How can we expect these two great agencies, the press and the radio, to speak fairly without knowledge of our side of the story? You must see that this executive has occasional contact with both newspaper and radio people in order that each may get to know and trust the other, so that when time is short and need for exchanging knowledge is great, everything will go smoothly.

Other contacts are also important. If you want something attended to, don't you try to think of someone connected with that particular company who will give the matter his personal attention? Surely. Therefore, management should ask its employees to become well known. Do they make an effort to become acquainted in the community, or do they just work eight hours? Do they increase the possibility of being useful to the company so that when some difficulty or question of interest arises the person will come to us with his problem? Likewise, management should see that employees get to know the people who lead organized bodies of all sorts in the territory. After all, these are the "doers" among our customers and we must know them and let them know us so that a mutual confidence will grow in each other. What we want to do is to promote a real sympathetic attitude between the company and the public by honest,

Proper handling of a complaint in the beginning is worth ten efforts to sell the Company to a customer once annoyed.

intelligent effort to make ourselves, and what we are trying to accomplish, understood, and we on the other hand, should develop the same sympathetic understanding toward our public, trying to get their point of view.

Let us, for a moment, examine some of the public relations activities of other industries.

Take, for example, the milk companies. I used to be awakened every morning regularly by iron tired wheels on a milk wagon breaking the stones on the road outside my window. As a result, I took several occasions to complain to the general manager of the local company. Whether my repeated remarks had any effect, I do not know, but they now have rubber-tired wheels on the wagons on my route, and my neighbors and I get another hour's sleep.

Two years ago, going to the A.G.A. Convention in Chicago, we arranged for a special car to take care of the people from our company. The railroad had a special man to greet us when we arrived in Chicago, and on the way home the name of our company was placed on a sign—in other words, the railroad went to a great deal of trouble to make us feel at home, naturally with the idea that we would use that road again.

An article appeared recently in the *Saturday Evening Post* explaining what the hotels do to teach their employees how to make everything flow smoothly when guests arrive and while they are staying in the hotel. Hotels find that a large portion of their business comes from guests telling their friends of the splendid service received.

Emerging from the depression, many customers feel grateful to the utility companies for the sympathetic consideration which has been given them when they were somewhat restricted in their ability to meet current bills. The average company adopted many changes and methods which they would have never thought of in the past in order to help the customer and thus help themselves. Naturally, it slowed up collections somewhat but customers now realize that the companies were and are ready to serve and do their best to cooperate, regardless of circumstances.

As to customers—other important factors, such as valuations, rate bases, etc., are practically unknown to most of them. The interest lies in the amount of the bill and when it must be paid. The amount, of course, depends on the rate, but the average customer seldom takes the trouble to figure it out. If you don't believe this, just ask the next man who complains about his gas bill what rate he pays. In eighteen cases out of twenty he will tell you he has no idea.

Naturally, customers have a great many different feelings about a company, and experience has shown that customers may be divided into four major groups, viz.:

1. Those who must be guided and helped in their business transactions.
2. Those who are easily satisfied, accept errors as a matter of course, and are blessed with dispositions willing to cooperate.
3. The group that is somewhat combative, meets explanations with doubt, and assumes a belligerent attitude toward any suggestion or recommendation. Difficult of cooperation.
4. The radical group. Always dissatisfied with work, explanations about detail, very hard to handle due to their entire lack of consideration for the other fellow—just impossible and non-cooperative.

Each class should be recognized. No. 2—those easily satisfied, should be appreciated but it is well to work toward getting the best results from

GREATER ATTENTION TO TOP COOKERY

NEW "DUAL-THRIFT" TOP BURNERS

Flexible accurately controlled, evenly distributed heat is essential for complete satisfaction in frying and top-of-the-stove grilling. The new Glenwood "DUAL THRIFT" TOP BURNERS, with special design features, meet these exacting requirements. Gas ports in this new burner are constructed to project the outer ring of flame in a nearly horizontal direction, thus exposing vessels to a uniform distribution of heat. This feature, coupled with the fact that the flame can be adjusted with fingertip control for innumerable heat intensities, provides greatly improved top cooking performance.

Advanced **Glenwood**

GAS RANGES

Send for your copies of new catalog No. 17

GLENWOOD RANGE COMPANY

TAUNTON, MASS.

DIVIDED COOKING TOP

SIX BURNER COOKING TOP

GREATER CONVENIENCE

The Divided Cooking Top offers the ultimate in top cooking convenience. Ample room to use four large utensils at the same time. No crowding . . . and the utensils on the rear burners are more accessible.

The centered table-top working space is made of Monel metal—durable and sparkling clean. Working space is more advantageous being adjacent to all four burners.

FOR EXTRA CAPACITY

A Six Burner Cooking Top should be in many homes to meet the demand for extra cooking. Before you sell your customers a new range show them what the new De Luxe Glenwood (4200 series) with Six Dual Thrift Burners will do.

the radical group. We should anticipate needs because if trouble is headed off before a situation becomes acute, we have accomplished something that subsequent explanatory calls by the head of a division, district manager, or other representative fail to do.

An analysis of the public relations question would indicate that to increase the sale of gas, management must see that there are proper persons in each office who can represent management from an impartial viewpoint. Most companies do have such a person, but this fact should be mentioned in passing and it should be referred to as a major point. The extra effort which a company may make in an attempt to impress itself upon the customer may be lost by over exertion. Proper handling of a complaint in the beginning is worth ten efforts to sell the company to a customer once annoyed.

And now we come to one of the most important aspects of public relations—the tactful handling of complaints.

If one of your customers makes a complaint and you find that the company is in error, do you yield at once? I heard a prominent man recently say that the public utilities should yield promptly when they are wrong and not fight, and then have to yield in the end, with subsequent loss of good-will. When wrong, yield quickly and graciously.

In this connection, management should stand back of employees when they are right. The employee should first be trained so that he can properly represent management, and if the employee is correct in making a statement to a customer, management should support his stand. If he is wrong, it may be the fault of his training. In any event, we should remember that the customer cares very little for our rules. He wants his problem settled his way.

Management could improve public relations by seeing that rules and regulations are formulated with enough flexibility to aid development of sound common-sense ideas. Rules are for the majority of the cases, but the remaining cases may require entirely different handling, calling upon the use of judgment by the individual.

Sometimes customers come to management's office with some solution of their problem which has been rejected because it was not in the rules. Frequently, the customer's suggestion is a good one. Take the case of the man who was temporarily leaving town and turned off the pilot on the water heater, thinking he was turning off the main burner, with the result that, when the water cooled off, a heavy flow of gas occurred and went up the flue. When he returned he received a bill for nearly $50. This customer told me his wife suggested that he pay for the gas on a cost-of-production basis rather than pay the full amount. Inasmuch as the customer didn't get any benefit from the use of the gas this was a reasonable suggestion which was adopted to his entire satisfaction. Automatic shut-off devices now eliminate this possibility.

Now some of you are thinking—why tell such a story in public? My answer is that we must not hide our light under a bushel. We do settle on a human basis so why not say so? Nobody else will say it for us. Usually our errors get plenty of airing—not our good points—and we want people to know we act decently.

Public relations are strangely cumulative, and no matter which way the winds blow in the future, the best way to plan for that future is to do a good job at present.

It should be borne in mind that some customers think all they have to do is to get in the front office to obtain anything they want. Such individuals should be allowed prompt access to the highest authority. They will get there in the end so it is useless to try to restrain them. Even if they don't get all they ask for, they are comparatively happy that they've met the "head man." Management should be careful that its office does not become known among employees as a "gift shop."

How would you like to read in tomorrow's newspaper a letter from a customer setting forth the details of how you handled his complaint? Would you be proud of the story? Does it stand the full light of day? Would you be willing for the president of your company to analyze the problem and your handling of it? If so, fine. If not, why not? Perhaps you were at fault, or perhaps a policy, which needs amending, hampered your required explanation.

A remark that one frequently hears in reference to John Wanamaker's remarkable success is that he, personally, always looked over the complaints received each day. He focused his attention on this problem because he felt that, in this way, he might learn what customers, who are willing to take the trouble to write to him, were thinking about his store.

(3) Coordinate Public Relations Factors

If management has a complaint set-up which permits it to keep a close eye on this important indicator of trends, it will provide the first suggested plan for coordinating the various public relations factors. Often a mistake analyzed by management will show that three or four departments are involved. Management's function should be to see that the complaint is used as an example so that it will not occur again. If complaints get bad enough to cause a customer to apply for outside help, it is your own fault. We have failed to instill confidence in our customers. There must be some trouble with management, or they would tell us about it instead of going elsewhere.

If management begins to check up on the complaints of a certain department, the head of that department will begin to wonder why and how, and he will probably realize—some quickly, some slowly—that his department allowed a customer to leave disgruntled and come to management with a problem which he should have handled. This is, again, a matter of training. First, in the department head of the realization of what has caused the complaint to get to management or to an outside group; and second, that he must give sufficient authority and training to his supervisors to enable them to have enough flexibility in handling cases so that it will not be necessary for the customer to fight his way higher up for satisfactory settlement.

An interesting article appeared in the "Reader's Digest," about two years ago, entitled "Don't Growl—Kick." Perhaps many of you read it. Our company traced some complaints directly to this article. In a couple of instances, during discussions of complaints with the customer, we observed the magazine on the living room table, and the customer admitted its effect. It suggested that you should be specific when you kick, and always kick to authority. It stated you should write directly to the president of the company and not to some minor assistant with no authority. It also pointed out that the average large concern has an official who does nothing but handle "kicks." It said that often the person who kicks is performing

(Continued on page 60)

POINTING OUT TO YOUR CUSTOMERS *that*

wasted heat means wasted $$

Surveys show that too many steam tables consume more fuel than needed! In almost every case savings were made by replacing with modern tables equipped with Robertshaw thermostats—or by installing thermostats on the tables in use.

Cut your costs WITH
ROBERTSHAW STEAM TABLE THERMOSTATS

Stop the waste that's going on at your steam tables! Check up and see how Robertshaw thermostats will cut fuel bills. Your gas company or equipment dealer will gladly make the survey.

Robertshaw-equipped steam tables actually save their cost in fuel reduction alone! That's the experience others have had. That's the experience you will have. In addition they prevent overcooking; loss of flavor; food spoilage.

Every day you delay means money out of your pocket. Ask your gas company or equipment dealer today.

ROBERTSHAW THERMOSTAT CO.
YOUNGWOOD, PA.

ROBERTSHAW STEAM TABLE THERMOSTATS
Cost So Little—Save So Much
FOR STEAM HEATED AND GAS FIRED STEAM

"Stop that waste of heat!" That's the warning that Robertshaw advertising flashes to your customers. *"Stop it with Robertshaw thermostats"* is the advice it gives. *"Have an equipment survey made in your kitchen"* is the action it urges—over and over again.

Install steam tables equipped with Robertshaw thermostats or convert those in use with Robertshaw controls available for that purpose.

The savings made by such installations have often resulted in sales of additional new equipment. In many cases complete kitchen modernization has eventually followed.

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

Your customers see heat going to waste over their tables. They see it again in the Robertshaw advertising. They see that Robertshaw steam table thermostats will stop that waste. Cash in on this strong promotional campaign. It's running now in your customers' trade papers.

ROBERTSHAW steam table THERMOSTATS

Cost so little—save so much!

(Continued from page 58)

a real public service. Perhaps this is true.

One way of hearing about complaints is through our representatives in the various civic organizations who should and will see about trouble before it gets too serious, if they believe management wants them to. They know people who will tell them of the difficulty in time to permit of proper explanation and treatment.

When we think of complaints, we think of criticisms of service, but we must also think of complaints about treatment received. In this connection, an important public relations problem is the handling of applicants for employment. Mr. Nicol, when he comes to his discussion, will probably say something to us about this question, because unless management takes the stand that every consideration and sympathy should be given to an applicant, he or she is apt to go away from the company with ill will in his or her heart, whereas with proper handling good-will can be created.

(4) Keep Up To Date on Public Reactions

An important part of a customer relations program is keeping up to date on public reaction. There is no question that an occasional survey by a group of contact people, actually going to customers' homes, will indicate present trends of customers' thinking about the company. Customer attitude cards in the hands of each contact person are also useful. The difficulty is to get the desired information written down. Training is needed here to encourage employees to file them—not for "spanking" purposes but to prevent repetition. Naturally, no employee wishes to "tell" on another employee, and management should explain why it needs a record of complaints.

(5) Plan for the Future

While keeping in touch with customer reaction it is also well to look ahead and try to anticipate what will be most effective for the future. In the present day, with things moving as rapidly as they do, public relations assume much greater proportions than ever before and we must not be caught napping. It is difficult to formulate a definite plan for the future, for it is like erecting a house on soft ground. The foundation must first be carefully constructed in order to build a lasting edifice. Public relations are strangely cumulative and no matter which way the winds blow in the future, the best way to plan for that future is to do a good job at present. Have your key men, in contact with the public continually, keep their minds active in an effort to suggest certain things which they believe to be the wants of the public. Here again it is a question of one man's ideas. What one man suggests may be entirely opposed by another, but it is still worthwhile to keep planning and sifting ideas.

It is interesting to look ahead a few years to the day when television will be generally in use. Certainly this will radically change our public relations problem. Customers wishing to discuss say a broken door hinge on a range will merely take the television set near the range and show us a picture in our office. The Sales Adjustment Division will save a lot of leg work. Our offices will be of a new type. Instead of cooking schools we will send a picture—customers will find little need to visit the office, except to pay bills. A picture of that won't do.

Management should see that proper facilities are available for visits to the gas company by groups of customers so that they may feel a closer tieup with the company through having actually seen the preparation of a bill, making gas, or some other company operation. The Chinese adage still holds good—"One picture is worth a thousand words," —or "one look is worth a thousand hears."

Summing up the points we have covered, management's customer relations job might be divided five ways:

(1) Fix a Public Relations Policy.
(2) Determine the public relations factors in your company.
(3) Coordinate public relations factors.
(4) Keep up to date on public reactions.
(5) Plan for the future.

In closing, I just want to repeat something told to me by a leading citizen. "People want to be friendly but you can't slap them in the face and expect them to *stay* friendly." It is management's customer relations job to prevent "slaps in the face" to customers.

Sell Martin VARIETY OVENS for a PROFITABLE COMMERCIAL LOAD

They bake a VARIETY of goods at the same time having separate thermostatic control for each baking chamber unit. New units may be added at any time.
By the use of a circulating heat system, heat is evenly distributed and they are more economic in gas consumption than most direct heat ovens.
Cake, bread and pastry can be baked at the same time. Their design and finish dress up any bakery, restaurant or kitchen.
They replace other fuels and obsolete gas equipment.
The 2 Section 4 Chamber oven shown is 6'-6" high by 6' deep by 7'-6" wide.

Ask for descriptive data and selling aids for salesmen.

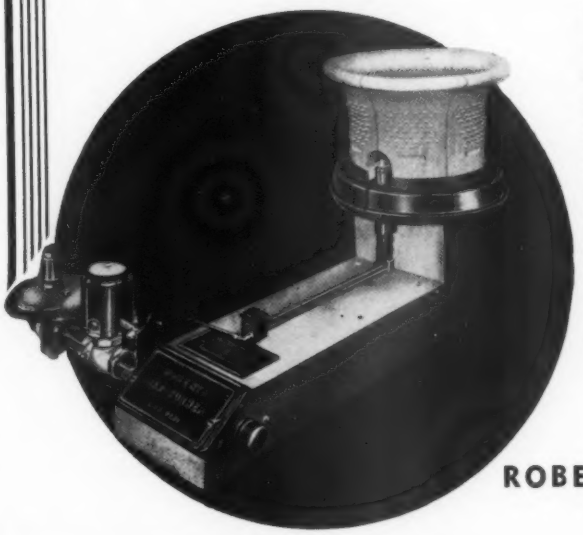
Martin Oven Co.
420 Lexington Ave.
New York

Variety Ovens meet with ready acceptance among the following:—

Bakeries
Hotels
Schools
Clubs
Restaurants
Hospitals
Churches
Chain Stores

ROBERTS GORDON

COMPLETE LINE OF CONVERSION GAS BURNERS PROVIDE CORRECT UNITS FOR ALL TYPES OF HEATING INSTALLATIONS



ELEVEN years of dependable service are back of Roberts-Gordon Conversion Burners. Correct models are designed by our engineers and well constructed to meet every type of heating installation.

Our line includes special models for Arcola heaters and large size commercial heating equipment.

The domestic gas heating market is your big load building opportunity.

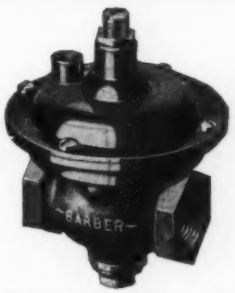
Ask for new catalog and Advertising Portfolio

ROBERTS-GORDON APPLIANCE CORP., BUFFALO, N. Y.

EFFICIENT *Service*

BISMARCK
HOTEL CHICAGO
RANDOLPH AND LA SALLE

Emil Eitel Karl Eitel Roy Steffen



Made in ¼", ⅜", ½", ¾", 1", 1¼", 1½", and 2" sizes.

Be Sure It's a

BARBER Gas Pressure REGULATOR

● There is no such thing as a "pretty good" Gas Pressure Regulator. A device so important must work within narrow limits and work infallibly. Barber Regulators are built to exact standards of precision, rigidly inspected, and GAS-TESTED FOR OPERATION WITHIN THREE-TENTHS PRESSURE DROP. Neat and compact design, all-bronze bodies, a quality product in every detail. A. G. A. approved, of course. Yet Barber Regulators are moderately priced!

Write for complete literature, prices and discounts on the entire line of Conversion Burners, Appliance Burners, Controls and Regulators.

THE BARBER GAS BURNER CO.
3704 Superior Ave., Cleveland, Ohio

Address Michigan Inquiries to The Barber Gas Burner Co. of Michigan, 4475 Cass Ave., Detroit, Mich.

HIGH GAS YIELD Low HOLDER COST

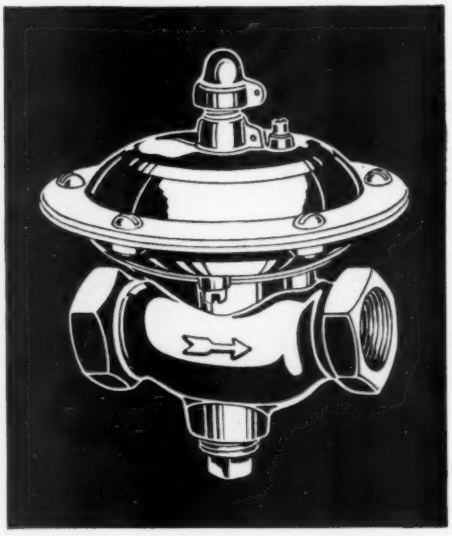
3 REASONS —

- ACI Quality Coals set the standard in 20 states for their high gas yield and low holder cost. They have the required structure . . . correct preparation . . . proper analysis. They are exceptionally low in ask and sulphur, high in fusion temperature and volatile matter, and give a high gas yield.
- The ACI mines of eastern Kentucky, eastern Tennessee, southwestern Virginia, and southern West Virginia, offer various grades and sizes which test and experience prove to be capable of meeting every production requirement for high volatile bituminous coal.
- Appalachian Service . . . engineering service, which has paved the way to cost reduction in many plants . . . is offered without obligation.

Write today for list of companies which produce and sell ACI Quality Coals

Appalachian Coals, Inc.
TRANSPORTATION BUILDING · CINCINNATI, OHIO

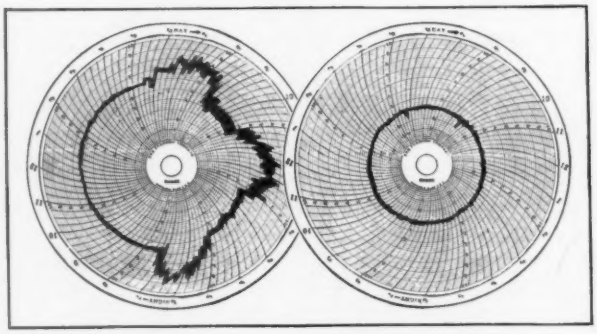
CONTROL!



● All Reynolds Regulators are built to fulfill certain definite requirements. This is one of the reasons why all REYNOLDS Regulators are recognized as leaders in Gas Control.

Reynolds Engineering policy of close co-operation with the trade has resulted in the development of a highly competent Engineering Staff. This service is available upon request and insures the installation necessary for safe, certain control.

Below: Actual reproduction of gas pressure charts. **On Left:** Shows wide fluctuation of inlet pressure. **Right:** Even pressure control through 24 hours period which is representative of the performance of Reynolds units.



Branch Offices:
421 Dwight Bldg.
Kansas City, Missouri
2nd Unit, Santa Fe Bldg.
Dallas, Texas

Representatives:
Eastern Appliance Co.
Boston, Massachusetts
F. E. Newberry
Avon, New Jersey

REYNOLDS GAS REGULATOR COMPANY
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

Pipe Corrosion and Coatings

Corrosion Survey

Part 12

By Erick Larson

A CORROSION survey is a recorded examination of the effects of corrosive forces on the physical condition of a metal. Exposure, for any reason, of a pipe provides the opportunity to observe and record the nature and extent of metal loss. Exposure consists not only of removing soil so as to disclose the pipe form but in addition all foreign material, products of corrosion, pipe coating or paint must be thoroughly removed so as to allow direct examination of the metal surface.

Reasons for Corrosion Surveys

The reasons or necessities for and purposes of a corrosion survey are in general three-fold; the advancement of knowledge, the evaluation of condition and safety. The advancement of knowledge may be subdivided into seeking the extension of theoretical knowledge and the collection of actual facts for the purpose of proving which of the radically differing opinions frequently existing as to the pipe condition or possible life are correct.

Reasons for conducting an evaluation survey are numerous. Periodic inspections will indicate the rate of depreciation and so allow the long term budgeting of repair or replacement costs. Ascertaining the corrosivity of the various soil types is sometimes the object. Another may be to provide the information for forming a decision as to the economics of repairing or selling deteriorated pipe for junk. Grading junk pipe is essential, as some may be sold for a higher price than scrap especially when adaptable for such temporary purposes as air or water lines on construction projects, etc. Evaluating surveys provide the information necessary to determine the value of applying a protective coating or adapting a policy of non-protection on pipe to be installed in similar soils either adjacent to or removed from the particular lines examined. An evaluating survey would determine the areas of extensive damage from electrolysis and the effectiveness of mitigating methods. A corrosion survey supplements records of replaced pipe and more directly indicates causes. A reason may be to provide the most exact information ascertainable on the effectiveness of coatings or the most corrosion resisting type of metal for use without protection. When new lines are to be installed parallel to or in the vicinity of existing lines a corrosion survey will assist in selecting the most economic design. Occasionally a number of lines exist in a single right-of-way or street and the necessity arises for abandoning one or more. A corrosion survey, or records of such surveys, would provide the information necessary to determine which of the lines had deteriorated most severely and thus aid selection of the one to be abandoned. When leakage records indicate that replacement of pipe may be more economical than continued repairs in place, corrosion survey records would indicate where the greatest intensity of corrosion existed and may limit the amount to be replaced and suggest the repair of the remainder.

An indication of the value of corrosion surveys in the formation of opinions as to the extensiveness of corrosion is indicated by the following tabulation. Considerable replacement of mains had occurred in a certain section where none of the mains or services replaced, exceeded fourteen years of age. Selection of the amount of pipe to be replaced had been left to the decision of foremen. As a preliminary survey of the affected area, forty-three locations were inspected. At each location the pipe had no protection. The sizes varied from a few ¾" services up to 2" mains all distributing gas at high pressures. While the ages varied from 2 to 12.8 years the majority were closer to the latter limit than the former. The results were as follows:

19% had a slight surface rust
39% had pits up to ¼ wall thickness
33% had pits from ¼ to ½ wall thickness
7% had pits from ½ to ¾ wall thickness
2% had pits from ¾ to penetration of wall thickness

This data indicated that corrosion had not been as destructive as a few penetrations indicated and therefore in most instances the welding of the pits in place was all that safety demanded although coatings were applied whenever pipe was exposed. One leak in a service is not a criterion that the whole has failed and a leak or two in one hundred feet of main does not necessarily call for complete renewal of the intervening pipe.

Safety is promoted by ascertaining through corrosion surveys the approximate age at which complete penetration may be expected and repairing before leakage has occurred or following out a long term program of replacement. Safety is also advanced by the determination of electrolytic conditions and their mitigations before the damage has been harmful.

The reasons for making a corrosion survey are frequently beyond the exact control of the operating utility as opportunity to determine the destructiveness by corrosion is often taken at all street openings made by other sub-surface users. A rapid method of acquiring a corrosion survey record is to use the opportunity afforded by opening made for service connections, joint repairs, valve examination or any of the other many reasons for exposing the structure.

[1] *Bureau of Standards Soil-Corrosion Studies, Paper No. 368, 1. Soils, Materials and Results of Early Observations by K. H. Logan, S. P. Ewing and C. D. Yeomans.*

[2] *Bureau of Standards Paper No. 696, Corrosion of Ferrous Metals in Acid Soils by I. A. Denison and R. B. Hobbs.*

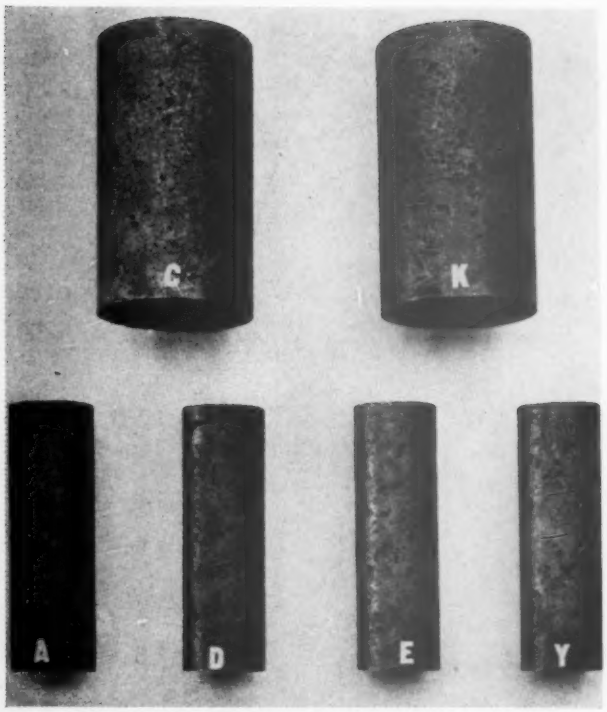


FIG. 1. Pipes of six materials buried in the same soil. Note similarity of types of corrosion on all specimens (1)

Scope

The scope of a corrosion survey need not be limited so as to include only pipes installed with the metal directly exposed to the soil but may be extended to include the lines which were coated with either metallic or non-metallic substances. While more intensive study has been made of transmission lines particularly for the economic determination of coating application a corrosion survey is also valuable on distribution systems. On the latter it is advisable to extend the examination to services which ordinarily are thinner walled than the majority of mains.

While the primary function of this series on corrosion and pipe coating has been the consideration of external corrosion, the scope of a corrosion survey may be extended to the internal condition of lines used for conveying liquids and gases. Methods have been developed for the internal examination of mains without cutting out specimens and to a more limited extent the qualitative measurement of internal corrosion without removal of specimens. The conditions requiring such examination are much more limited and considerably more costly than surveys to determine external corrosion. The limitation of the necessities for internal inspection has led to its exclusion from this discussion.

A valuable addition to the scope of a corrosion survey is the inclusion of a record of other metal structures encountered. There frequently exists adjacent to or crossing one utility's lines those of others but of entirely different metals. Inclusion of a record of these other metals would facilitate selection of another metal should a change be desired in one's own system.

Frequency of Survey

The frequency with which a corrosion survey should be conducted is a matter for local decision depending to a considerable extent upon the severity of the rate of corrosion. Single observations are of practically no value in determining the variations occurring in the rate of corrosion as previously mentioned. As a survey in the same locality must be made more than once records must be kept and on the facts disclosed by these records the intervals will be decided. The purpose would affect the frequency. Some of the items previously mentioned as affecting the rate of corrosion would have a bearing on the frequency.

Methods

The two general methods of conducting a corrosion survey are by visual inspection and qualitative measurement. Ordinarily with millions of dollars per annum involved any visual method of evaluation could be dismissed with a gesture but such practice has been so common that mention of the methods pursued are necessary. A visual examination is the only means of determining the form of corrosion and therefore an important tool in producing a finished product.

Visual Survey

One visual method is to grade the results of corrosion into ten divisions and have available for frequent reference or even carry into the field ten standards each representing a grade. The inspector from recollection or direct comparison with the standards then classifies the extent of corrosion on the pipe being inspected. Preparation of both the standard and specimen affects the grading. The nature or appearance of the deposited products of corrosion unless thoroughly removed may hide the true extent of metal loss and if removed from the standard it will no longer present the appearance of the pipe specimens when initially exposed, and before cleaning. When the corrosion is uniform the appearance of several grades may be identical. As mentioned previously several Bureau of Standards investigations have indicated that each soil type produces a distinct corrosion pattern if intimately examined. Therefore, a standard established for one soil type may be difficult to apply in another.

A visual inspection may produce good results, especially when direct comparison with the standards is made, when the pitting is scattered and the intervening pipe surface offers a distinct contrast in color between the pitted and remaining areas. Such color distinction is not frequent when the intervening pipe surface is corroded. Color comparisons are frequent in chemical analysis and produce sensitive results when conducted by an experienced operator who is continuously engaged

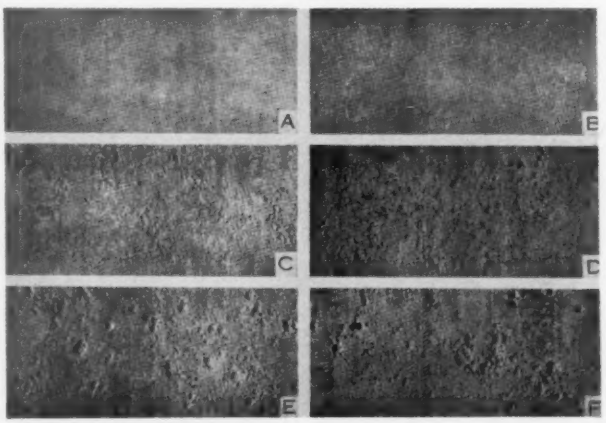


FIG. 2. Types of corrosion shown by ferrous specimens in various soils. (2)

in such analysis. No attempt is made to remember colors in chemical analysis, all tests being by direct comparison. The continuity of testing is vitally important in producing accurate results. Color is the most important element in making comparisons. Even pit depths are frequently judged, when comparing with a standard, by the color or shading. Light conditions would particularly affect comparisons and not only increase the difficulty of accurately judging pit depths but also areas. Inaccuracy may be increased where pits are numerous or small in area as the tendency would be to compare the areas of the pits rather than the depth which is of the most practical importance. Even area comparison accuracies are dependent upon the frequency of application.

The records of visual surveys are more in the nature of opinions and therefore subject to extremely large errors in predicting the life of pipe. The widely differing opinions on corrosion result to a considerable extent from a lack of qualitative data. Attempting to judge the extent of damage from corrosion by a casual or even intensive visual inspection is subject to the distinct disadvantage of evaluating miles of line from the inspection of a minute percentage in addition to the other factors already mentioned as adverse to such a method of surveying.

Qualitative methods while requiring slightly more time for observations, recording and interpretations have produced results so far superior to visual inspections that the discussion to follow will be limited to such procedure.

Classification

One of the first steps in a qualitative analysis of corrosion is to classify the result of deterioration so as to facilitate the selection of a method of measurement. In classifying, the practical aspects will be emphasized rather than the advancement of theoretical knowledge. While much remains to be discovered regarding the theory of corrosion it is felt that theoretical knowledge at present is far in advance of practical application. The two general methods are to classify by quantitative or qualitative analysis or visually into the various phases easily and accurately catalogued by such a procedure.

Classification by analysis is sub-divided into two phases, the general causes or types of action causing corrosion and specific causes which is by stating the one or more corrosive agents causing the major portion of the damage.

General Causes—Theoretical Reactions

Solution
Chemical Reaction
Electrolysis
  Galvanic
  Stray Current

Solution would ordinarily not result in more than a light surface corrosion unless there was a movement of the liquid in which the metal was soluble. In a still solution; whether pure water, acid, alkaline or neutral in nature; corrosion would only occur until the solution had become saturated with the metal. In a moving solution the corrosion would occur at a low but constant rate unless interfered with by insoluble or non-porous deposits which may be products of corrosion forming simultaneously with the metal going into a solution or deposits of other than corrosion products. Some of these formations may not entirely exclude the solvent from access to the metal but will materially limit the rate of solution.

Chemical reaction would include the various phenomena previously mentioned in which an acid or alkali may react directly with the metal to produce a metal salt.

Electrolysis would include all instances where local conditions produced all the necessities for a galvanic cell or where the current flowing from the pipe at the location where deterioration was occurring, which is the most important point to an operator, originated from any one of a number of causes at some more or less remote point.

Classification by Corrosives

Classifying by the specific causes or actual corrosive agent or agents involves considerable analysis.

Corrosives—Specific Causes

Oxygen	Alkalies
Oxydizing agents	Organic matter
Waters	Live vegetation roots
Liquids—oils, etc.	Soil
Brines	Air pollution
Salts	Strains
Sulphur compounds	Temperature
Acids	Sun on exposed surface

The detailed analysis required to determine either the general or specific causes of corrosion ordinarily involves more expense than is justifiable particularly

FIG. 3. Note material tenaciously adhering to pipe and corrosion evident after removal.

when mains exist on which actual measurements may be made of the extent of corrosion. When it is required to extend experience received in one locality to others where there are no mains, some of the details mentoned above are necessary to assure that similar soil types and comparable conditions exist.

The ease with which soil resistances may be determined provides a valuable means of approximate comparison between territories but such readings are not usable as a means of classification. Resistance readings may be the same although taken in soils producing entirely different corrosion characteristics.

Classification of corrosion by the soil type in which it occurs is an indirect method involving mostly a visual inspection although frequently requiring expert assistance or analysis. As illustrated in Fig. 1 each soil type appears to produce a characteristic corrosion formation. Classification of corrosion characteristics by soil types has been suggested by the United States Bureau of Standards as worthy of close study in each territory. This particular method of classification is of more assistance on transmission lines than on the ordinary distribution system.

Classification by Metals

A broad corrosion classification is by metals. There is no form of corrosion which is typical or characteristic of the commonly used metals such as cast iron, steel, wrought iron, brass, copper or alloys except graphitization and dezincification. The appearance, characteristics and extent of deterioration on one metal or form of

metal may be reproduced on any or all of the others as also illustrated by Fig. 1. However all records should include the type or form of metal.

Classification by Appearance

Strictly visual classification may be divided into two sub-divisions; location and forms or appearances.

Location
- Body of pipe metal
- Joint
  - Circumferential
    - Screw
    - Welded
    - Brazed
    - Dissimilar metal
    - Slip coupling
  - Longitudinal
    - Welded
    - Lap
    - Butt
  - Service
    - Detailed location
  - Fittings
    - Valves
    - Cocks
    - Drips
      - Internal or external
  - Geographical

The most practical of all methods is a combination of the location classification with the form.

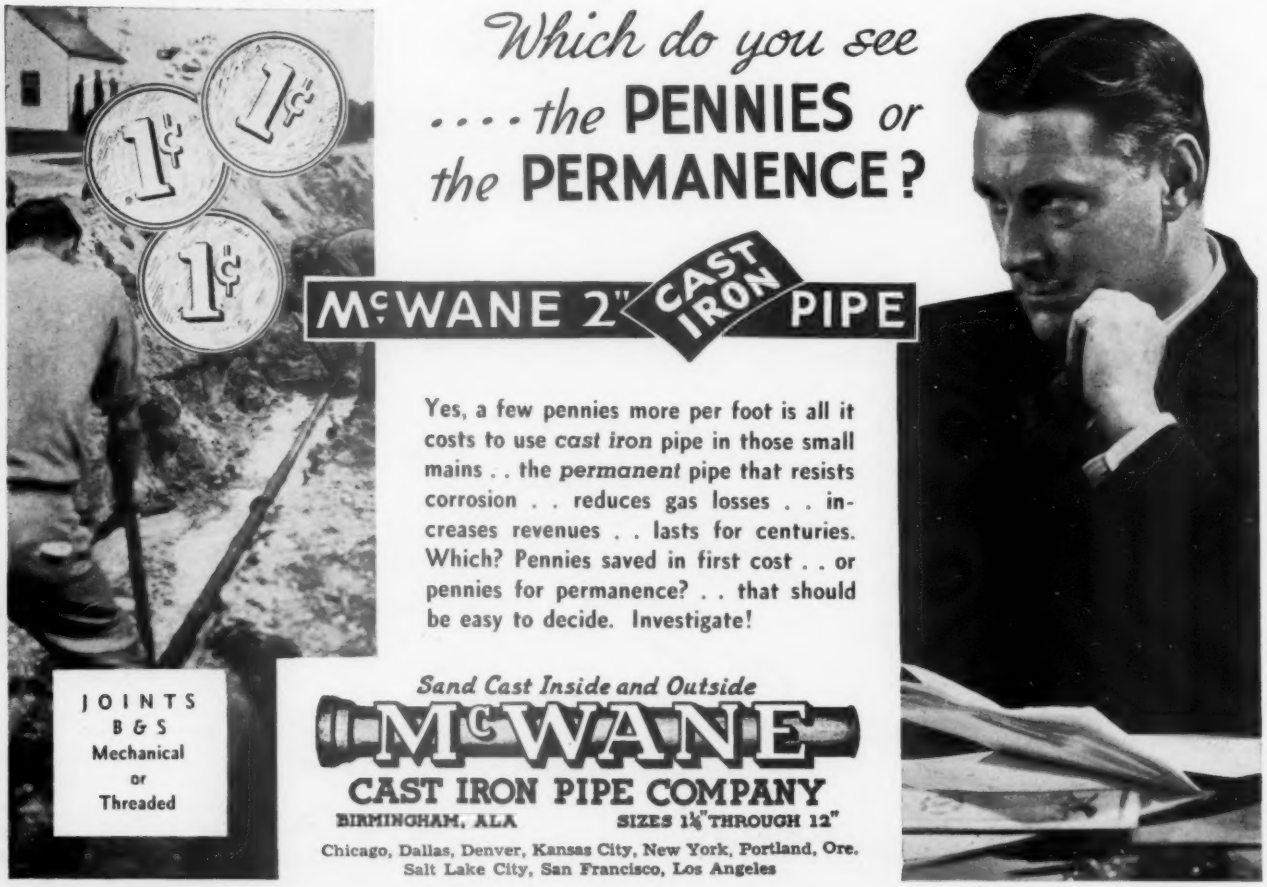
Form or Appearance
- Surface
  - Localized or general
  - Uniformly thick
  - Ridged
  - Pitted
  - Graphitized
  - Dezincified
  - Eroded
  - Cracked or fatigued

Each of these classifications must be qualified to assist in determining causes should that be desired at the time of survey or in the future. The first three subdivisions and erosion may be characterized by an etched appearance caused by removal of the corrosion product as rapidly as formed. The metal surface in such instances may be bright and readily reflect light or of an aluminum paint texture and color. In both instances the surface would rapidly loose its glossy finish or darken because of corrosion when exposed to the atmosphere.

The material tenaciously adhering to the pipe and/or the products of corrosion are thoroughly removed previous to classification but a noted description of the appearance, color, form and extent of the scale may be of value. Particularly in sandy soils there may be a thick layer of soil, the particles of which have been cemented together by corrosion products. Frequently this layer can only be removed by hammering and the pieces break off similarly to a layer of cement.

The uniformity of any of the forms should be noted. For instance a pipe which has been uniformly corroded adds difficulty to the qualitative analysis. Pits measured from a uniformly corroded surface would be questioned as to accuracy.

(To be continued in July)


Which do you see
....the PENNIES or
the PERMANENCE?
McWANE 2" CAST IRON PIPE
Yes, a few pennies more per foot is all it costs to use cast iron pipe in those small mains . . the permanent pipe that resists corrosion . . reduces gas losses . . increases revenues . . lasts for centuries. Which? Pennies saved in first cost . . or pennies for permanence? . . that should be easy to decide. Investigate!
JOINTS
B & S
Mechanical
or
Threaded
Sand Cast Inside and Outside
McWANE
CAST IRON PIPE COMPANY
BIRMINGHAM, ALA
SIZES 1¼" THROUGH 12"
Chicago, Dallas, Denver, Kansas City, New York, Portland, Ore.
Salt Lake City, San Francisco, Los Angeles

"Using CHACE Thermostatic BIMETAL IN THE Cooper "KING" OVEN THERMOMETER"

Look at America's finest ranges and you will find them equipped with Cooper Oven Thermometer, noted for accuracy and reliability.

If your product calls for automatic action at change in temperature, or yours is a problem of automatically controlling temperature, Chace Thermostatic Bimetal may be your solution.

Sold in sheets, in strips, and shaped for assembly.

COOPER OVEN THERMOMETER COMPANY

CHACE THERMOSTATIC BIMETAL "It Bends with the Heat"

W. M. CHACE CO.
1610 Beard Avenue - - - Detroit Mich.

HIGH PRESSURE **GAS HOLDERS** LOW PRESSURE

PURIFIERS · TANKS · CONDENSERS
STEEL PLATE CONSTRUCTION

INTEGRITY GOOD WORKMANSHIP FAIR DEALING

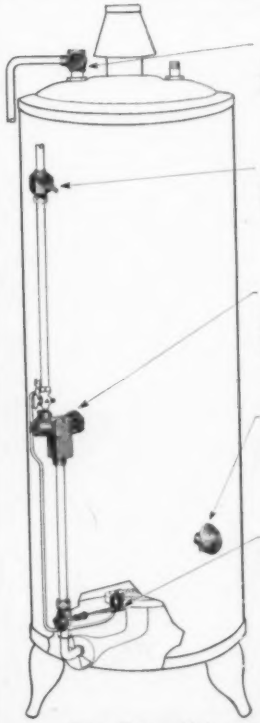
CRUSE-KEMPER CO.
AMBLER, PA.

JOHNSON NO. 118
Combination Bench Furnace

Here is the finest, most usable Bench Furnace made. It is designed for any shop or industrial use and will heat the largest soldering coppers, branding irons or stenciling irons. This furnace is also very efficient for tempering, heat-treating, annealing, case-hardening or soft metal melting. Heating long rods or sweating joints is also possible by opening the side doors in the Johnson Patented curved shape hood. A 22 lb-capacity melting pot fits in top of hood. Fired by three powerful Johnson Bunsen Burners. Quick intense heat without use of forced air blast. Investigate this outstanding furnace today. Write for free catalog.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

For Perfect Control Specify Titan



Titan Relief Valve

Prevents excessive pressure and temperature. Pressure relief at 150 pounds. Temperature relief at 200° F.

Titan Safetystat

Automatically shuts off all gas to the burner in the event excessive temperatures are developed.

Titan Snap Action Thermostat

Is an extremely sensitive instrument providing perfect control of water temperature. Equipped with a Temperature Selector.

Titan Nu-Drain

Its compact design provides almost complete concealment of the body. It improves the appearance of any heater.

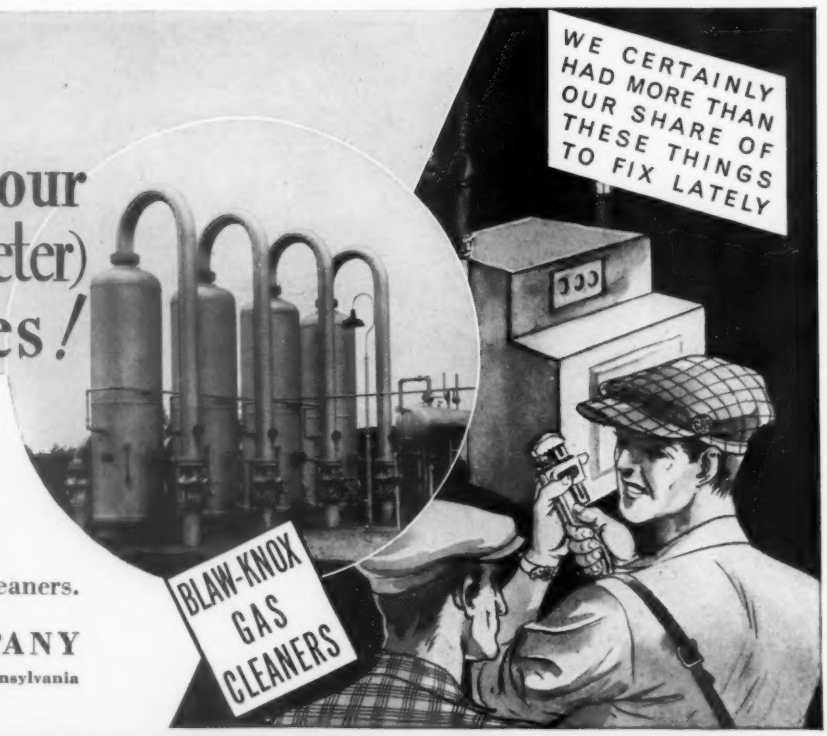
Titan Safety Pilot Control

Automatically prevents escape of unburned gas from main burner in case the constant pilot flame should become extinguished.

Titan Controls are built to meet the rigid requirements of water heater manufacturers. Catalog and full details on request.

The Titan Valve & Manufacturing Company
Thermostats—Safety Pilots—Relief Valves—Safetystats
9913 Elk Avenue N.E. Cleveland, Ohio

Protect your "cash register" (meter) against losses!



● Dirty gas makes meters slow. Protect your income by insuring continuous delivery of clean gas through the use of Blaw-Knox Gas Cleaners.

BLAW-KNOX COMPANY
2072 Farmer's Bank Bldg., Pittsburgh, Pennsylvania

BLAW-KNOX GAS CLEANERS

BLAW-KNOX

All sizes up to 3,400 cu. ft. capacity

Meters
Diaphragms
Repairs
Provers
Pumps
Calorimeters
Wet Meters
Gauges
Apparatus

METER REPAIR PARTS

FOR
ALL MAKES — ALL SIZES OF METERS

LARGEST GAS COMPANIES NOW USING OUR PARTS

SEND FOR OUR CIRCULAR ON METER REPAIR PARTS

SAMPLES AND PRICES GLADLY SENT

— 0 —

LAMBERT METER CO.
BUSH TERM. BLDG. 4, BROOKLYN, N. Y.

THE GOODMAN STOPPER

GOODMAN — USED SINCE 1897 — 2" HANDLE & LOCKING SLEEVE — GAS MAIN STOPPER

The Reliable Shut-Off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, New York

GAS SERVICE STOPS

SINCE 1869 Hays has built dependable brass products for the Gas Industry. Standard, Special Weight, Heavy Pattern and High Pressure Stops to meet all requirements are manufactured by Hays in a full range of sizes. Write for Catalog No. 4 today.

HAYS MANUFACTURING CO. ERIE, PA.

Diaphragm Meters—Operation And Design

Part 2.

by

Allen D. MacLean,

Chief Engineer

Pittsburgh Equitable Meter Company

THE effect of valve timing is familiar to meter men, for in running proofs on meters, almost invariably a "check" rate, and "open" rate is run. This merely means that two widely different rates of flow are used in testing meters so that the valves can be adjusted to their proper relation to the diaphragms.

So in this matter of meter accuracy it is not only necessary to adjust the length of the tangent, which sets the theoretical diaphragm stroke, but also arrange the relation of valve motion to diaphragm motion. These two adjustments are not difficult to make, but should be made with a great deal of care.

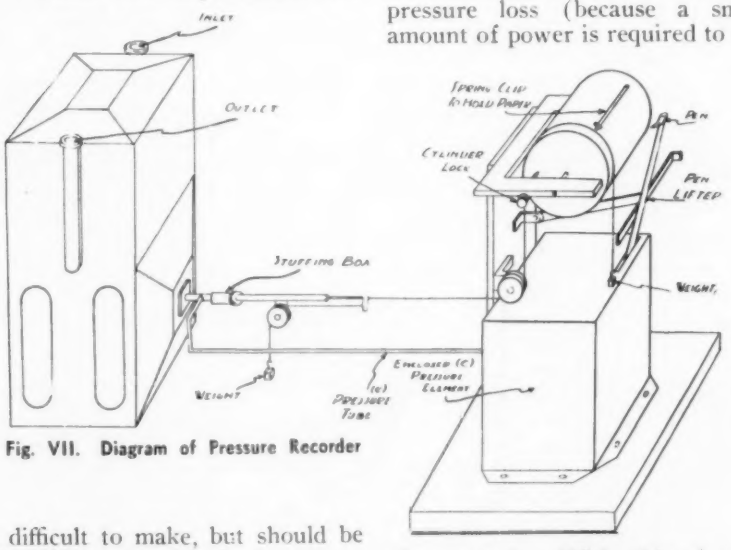


Fig. VII. Diagram of Pressure Recorder

There is another phase of pressure loss affecting accuracy which we must also recognize. If the overall pressure loss $P_I - P_O$ increases or decreases, it not only causes adverse effect to the inaccuracies which originate with valve timing, but changes the overall proof curve. In proving the meter initially a certain valve setting is arrived at which gives the desired accuracy for the pressure loss curve of the meter at the time of proof. Any change in the pressure loss curve will tend to move the accuracy curve away from its true value, and also changes its slope. If for any reason the overall pressure loss decreases, the actual pressure difference across the diaphragm $P_{DI} - P_{DO}$ will decrease and we have a tendency to slight the full stroke, and hence a fast meter. This is exactly what happens with a new or repaired meter where the flag rod stuffing boxes and some of the bearing points eventually run themselves in during the early period of operation and decrease the mechanical friction. This means a decreased pressure loss (because a smaller amount of power is required to drive the meter). With this decreased pressure loss, the pressure difference across the diaphragm decreases and we have a fast meter. This effect is familiar to all meter men.

There can be a great many problems arise from a close study of the valve timing relation, and the general question of pressure difference across the meter. A mathematical analysis of any existing meter in commercial use in this country will show that there are certain errors and design factors in valve timing, rate of change in displacement in the diaphragm, and flow of gas, which depart from a theoretically correct meter. These mathematical studies are borne out by a practical method of study originated by Mr. E. R. Gilmore, of the engineering department of the Pittsburgh Equitable Meter Company. In these studies a device actually plots pressure in a diaphragm chamber against the actual diaphragm stroke in exactly the same way indicator card diagrams are made for steam engines. This apparatus is shown in Figures VII and VIII. Some of the indicator cards made by this apparatus are shown in Figure IX. At the right of Figure IX we have shown what the card of a theoretically perfect meter should be. An actual study of a great many types of existing meters show that none even approach the theoretical standard. Two detrimental effects arise from this condition. One, which we have discussed at length above, causes inaccuracies because of variable pressure difference across the diaphragm. The other is that because of these uneven pressures, there are times when one diaphragm strives to move faster or slower than its companion diaphragm to which it is connected and we have an increased wear on all bearing points.

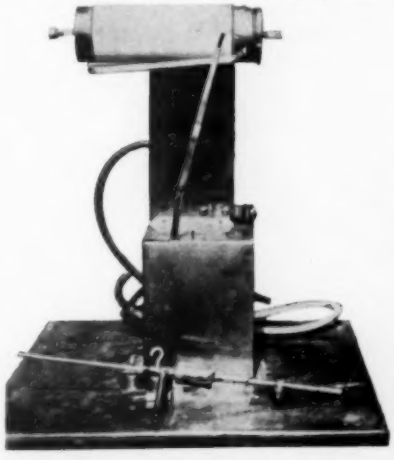


Fig. VIII. Pressure Recorder for Gas Meters

Wear, which takes place to a certain extent in all moving mechanisms, will affect not only the stroke of the diaphragm, but also meter timing. Worn bearings, shafts, etc., in those parts supporting the diaphragms and controlling its movement, allow eventually greater clearances which means slow meters.

Wear in the crank and valve links means delayed valve timing which means slow meters. Deflection of parts also is variable depending on the strain on them. Thus as the pressure loss across the meter changes, we have a different strain, and therefore some of the diaphragm guiding parts will give more at certain times with resultant inaccuracy.

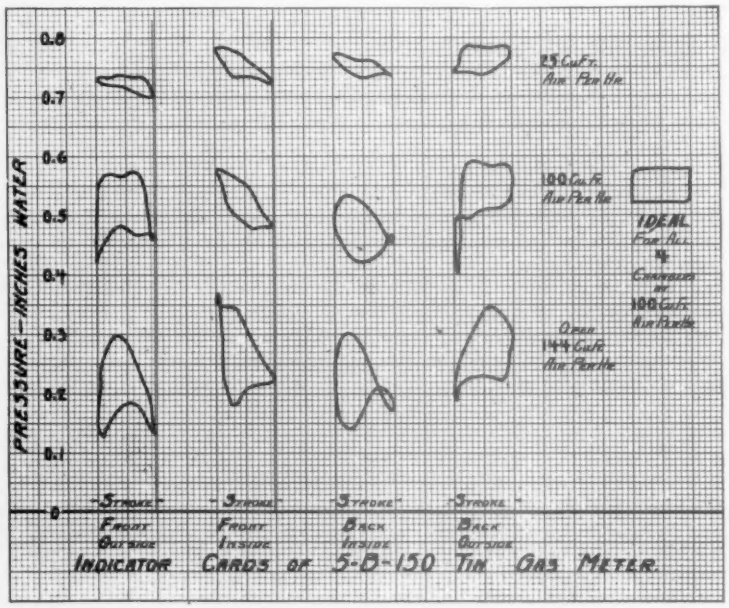


Fig. IX. Gas Meter Indicator Charts

There is another troublesome feature in accuracy control, and that is the actual "bellowing out" of the leather part of the diaphragm. Much has been said and written on the subject of diaphragm material, but we still find sheepskin the only commercial material satisfactory. At each end of the diaphragm stroke, the pressure loss across the diaphragm affects this leather, by causing it to bellow out or in, by smoothing out folds, etc. This change of displacement is apart from the actual change of stroke of the metallic diaphragm pan. It is very difficult to predict but it has some numerical value, does affect meter accuracy and must be taken into account in our studies. We see then, that what is a theoretically true "swept volume" or an exact diaphragm displacement is actually a variable. Wear, diaphragm shrinkage and stiffening, deflection, coupled with variation of pressure difference across the diaphragm, all contribute to meter errors.

With this array of effects all trying to cause meter inaccuracies, what can we do to counteract them, what design changes can be made, or what designs can we put forth to eliminate them? Obviously when wear is a factor we can use better materials for bearings, larger surfaces, and more protection against dirt and corrosion. Where deflection or give of the parts is a factor we can use larger and stouter parts. These two things we actually do in the large diaphragm meters built for the high rates of flow and for high pressure gas where the gas density causes high pressure losses throughout the meter. In small domestic meters there is a possibility that much can be done to eliminate wear by using better designed bearings and materials.

In small domestic meters we have two points which seem to contribute to meter inaccuracy to a fairly large degree, and it would seem could be easily remedied. One is the valve and valve seat areas. The actual contacting area between valve and valve seat is relatively large, and could be cut to less than one-half their present contact area, still sealing well. By thus decreasing frictional drag and wear on all the valve driving parts, the proper valve timing relation would be maintained for a long period of time. The newer meter designers in this country have decreased this area to a certain extent, yet the English and Germans have made a very drastic reduction in this area of contact with apparently good results.

The flag rod stuffing boxes in domestic meters represents another point where errors originate. In the usual design, the packing material of this gland must perform the dual function of sealing against gas leaks, and supporting the flag rod in its true position. Initially the packing may be set properly, but the friction imposed by the operation of the flag rod will gradually wear the packing until first, small leaks result, and second, what is more important, the flag rod will not be constrained to operate in its true position but under strain will allow the rod to move away from its true center. Thus if the diaphragm stiffens slightly, it will resist making its full stroke, a strain will accumulate at the flag rod bearing, and the packing, which acts as a bearing will give and not constrain the diaphragm to make its full stroke, with a resulting fast meter. Also, as packed initially these boxes are sometimes tight and stiff, offering a mechanical friction which must be overcome, so that the pressure loss across the meter is high. Operation of the meter will decrease this stiffness, a smaller overall pressure loss is required with a smaller difference in pressure across the diaphragm, resulting in a fast meter. The ideal design would be one in which the shaft support would be a metallic bushing rather than packing, and the sealing method a flat disc not exerting much friction, or not subject to change in friction. In this way inaccuracies due to permitting shaft movement and due to change in friction will be eliminated.

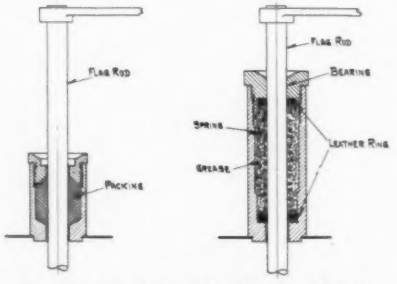
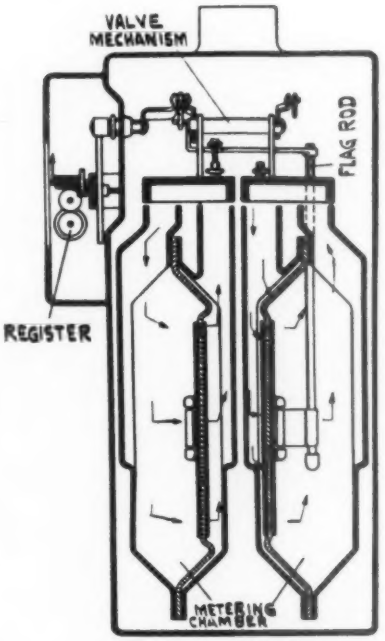


Fig. X. Tin Meter Stuffing Box Design

This type of stuffing box is being used successfully in some of the later iron meters, and should prove valuable in the familiar tin meter construction. Figure X shows a comparison of the existing design and the suggested design.

There is, however, another possible approach to the problem, and that is a completely new meter, designed initially to eliminate the difficulties due to variation in diaphragm displacement and to improper valve timing. The manufacturers in Europe have already proceeded along these lines with a fair degree of success, and it will interest us to see just what



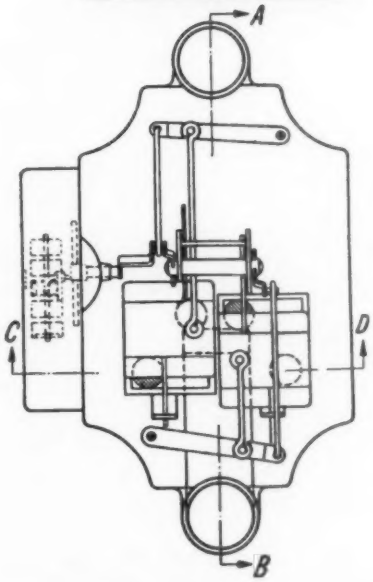


Fig. XI. Positive Stop Meter

these methods are of increasing meter accuracy.

Proceeding from the fact that the diaphragm displacement should be a constant, independent of all other conditions in the meter, if a truly accurate meter is to be produced, some designers have felt that a "positive stop, diaphragm is necessary, i.e., the stroke of the diaphragm is stopped at its end by coming up against a solid member which will not yield. By insuring that the valves are delayed just a trifle so that there can be no cut off before the diaphragm has contacted its end positioning member, a fixed movement of the diaphragm disc is obtained, always constant in spite of pressure loss or valve timing. Figure XI shows such a meter which has been in successful use for a number of years. It will be noted that besides limiting the diaphragm stroke, a metal liner also controls the shape the leather takes at each end of its stroke. This arrangement not only positively limits the stroke of the metallic disc, but attempts to control the shape of the leather at each end of the stroke.

Hence, for each cycle of the meter —no matter what the pressure loss is or the rate of flow, no matter how much wear has occurred on the guiding parts, the diaphragms will displace a very definite and unchanging swept volume each cycle, and, discounting the possibility of internal leaks, the meter will stay very close to an accuracy of 100%.

Particularly interesting is the valve movement, because the familiar crank is eliminated. We have seen that in two-diaphragm meters one diaphragm is at the end of its stroke, with its valve at the center or change-over position, while the second diaphragm is at the center of its stroke with the valve at the end. The design shown has made use of this relation, and the designer connects the valve of one diaphragm directly to the opposite diaphragm, so that the right diaphragm controls the position of the valve for the left diaphragm. The actual connection between the two diaphragms, so that they will stay roughly in relation to each other, is through a center connecting member which also drives the index directly A study of the angularity relation at the point the diaphragms both connect to this common member will show that each diaphragm is somewhat independent of the other in its position; i.e., there is clearance enough in all moving points so that each diaphragm can move independent of the other. The connection between them merely insures that they will not both be on dead center at the same instant.

There are, of course, many construction differences between this positive stop meter and the diaphragm construction with which we are familiar. The leather texture is in general much softer and thinner than in American practise and the design is so arranged that the leather actually makes contact with the limiting shell at each end of the stroke,

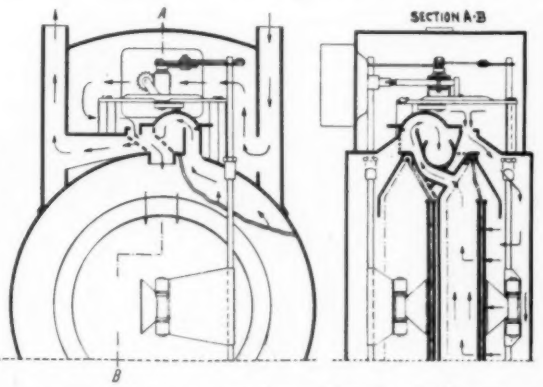


Fig. XII. Positive Stop Meter with Rotary Porcelain Valve

a practice which is studiously avoided in this country.

In Figure XII we see another positive stop diaphragm construction, but in this case a rotary valve is used. The diaphragms are limited in their stroke by means of a shell-like structure both as to the metallic displacement and as to leather displacement. The rotary valve is made of porcelain and controls the flow to all four measuring chambers.

The two meters illustrated above are based on the principle of limiting the diaphragm stroke on the two diaphragms. There has been quite a development in Europe of the single diaphragm meter employing poppet valves. Figure XIII shows a construction in which a single diaphragm is employed and the dia-

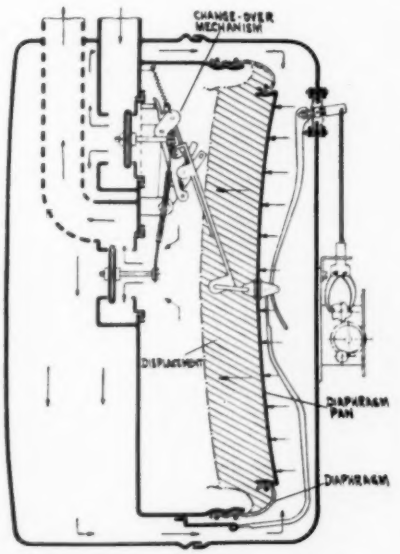


Fig. XIII. Single Diaphragm Poppet Valve Meter

phragm is connected to a pair of poppet valves. It will be noted in the position shown that the gas goes in through the top poppet valve into the space defined by the external meter case and pushes against the diaphragm, moving it toward the left. At a certain point in its stroke the valve actuating rod operates the valve mechanism and both valves snap simultaneously, the top valve moving in such a manner that the gas now enters to the internal chamber of the meter and the diaphragm moves from left to right, forcing the gas from the external chamber out through the outlet connection. In this construction, the displacement which is shaded in this drawing can vary somewhat depending upon the time of actuation of the poppet valves. However, instead of using an exact fixed displacement in this meter, the registering mechanism is so arranged that the amount of advance of the index depends upon the stroke of the diaphragm. At the right of this construction we see a lever arm connected to the diaphragm and passing through the external case through a leather tight seal. This arm operates with the index and the details of operation are shown in Figure XIV. By examining this construction we see that with the diaphragm moving in one direction a rachet gear is moved, driving the index. When the diaphragm moves in the opposite direction a second ratchet gear is driven and the first remains stationary. The drive of both of these gears is accumulated to the index so what actually is measured is not the number of times the diaphragm makes a stroke but the actual distance through which the diaphragm moves. Thus any stiffening of the diaphragms or wear of those parts which tend to change the diaphragm stroke does not affect the final registration.

Figure XV shows another construction using the same general principle, with, however, a somewhat different arrangement of poppet valves. It will be noticed that in this construction the diaphragm is of peculiar shape, so designed to employ the greatest displacement available in the case. The same system of measuring diaphragm stroke rather than counting the number of strokes is used. There is, of course, a great deal of mechanism in this type of meter and the inclusion of springs actuating poppet valves may be quite a shock when considered in connection with domestic meters. However, the literature on the subject states definitely that the poppet valve has been very successful in German practise and avoids a great many of the difficulties encountered with the ordinary D valve.

There are in Europe a great many arrangements of meters employing the same diaphragm principle employed in our meters, that is, the stroke of the diaphragm is controlled entirely by linkages. The arrangement of these meters takes a great many different forms. However, almost all of them depart from the broad valve contact surface employed in this country and we find a very marked tendency towards hair-lined valves. We also find a tendency to place the valves parallel and in some cases we find valves which operate through an arc rather than along a straight line.

It is questionable as to whether these improvements alone should be applied to our meters. If we are to maintain the same diaphragm system as we now use, it would not seem worth while to bring about very many changes which would interfere with our present systems of repairing and handling meters. Redesigned stuffing boxes, and valves with smaller contact on seats are changes which could be made without interfering greatly with present repair practices. However, if it is felt that a higher degree of accuracy is to be attained, the positive stop diaphragm as illustrated by Figures XI and XII, or a single diaphragm meter in which the length of the stroke is measured by an index, as in figures XIII and XIV, would seem to be the best path of development. Theoretically and practically these two systems of measurement do offer a possibility of improvement over our present systems and any marked increase in accuracy will probably have to come from some such development.

There is another point in meter construction which seems to have escaped most designers. A tin meter or an iron meter for domestic service can hardly be called a thing of beauty. The tin meter is hardly more than a rectangular case of sufficient size to enclose the parts. Iron meters for domestic work are usually awkward looking castings designed to give the minimum weight for the space requirements of the mechanism. The tendency in industrial design, even in those articles which are not normally viewed in detail, is towards better lines and a higher degree of symmetry. The European meters have progressed

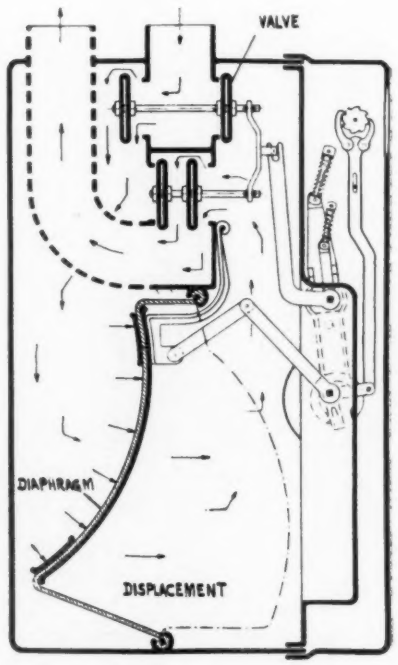


Fig. XV. Single Diaphragm Poppet Valve Meter

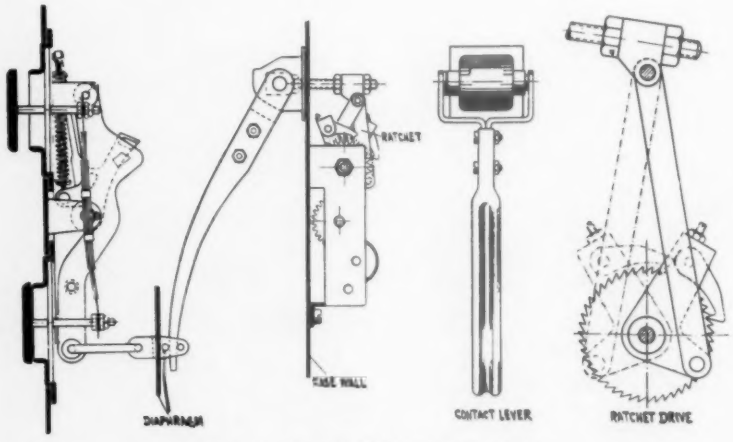


Fig. XIV. Details of Meter of Fig. XIII

somewhat along these lines and in their external appearance present an improvement over our practise. However, they do leave very much to be desired. Figures XVI and XVII show the external appearance of typical European meters.

Fig. XVI. A.E.G. Gas Meter

With the advances made in industrial design for appearance, and with the newer materials available, the meter designer should be able to produce a better looking meter than any former models. This may prove to be another paradox for the gas industry, a "beautiful gas meter". The trend toward beauty in mechanical things can do a lot in increasing the sales appeal, and it is probable that in a gas meter it may do something to minimize the vindictive regard that many consumers have for this hard working piece of apparatus. In these days of bars and game rooms in the basement of houses, the gas meter can be the one eye sore in an otherwise beautiful picture.

We have dissected the theory behind diaphragm meter measurement and pointed out sources of error in measurement. We have even called our existing gas meter ugly. This must not be considered as a sweeping criticism of existing meters, for as stated before, this product, almost

Fig. XVII. Pintsch Gas Meter Meter

a hundred years old, has done a good job throughout the development of the gas industry. We must remember that meter repair shops have been developed on a fairly standardized product; that personnel has been trained and methods worked out to handle our existing design, with a resulting low maintenance cost; that the public has been given commercial measurement commensurate in accuracy on the average with other commodities they buy.

On the other hand, there are inaccuracies and situations arising from these inaccuracies, which can be undesirable. Anything we can do to insure smaller deviations from accuracy will help public relations, and insure customer trust and confidence. A less tangible benefit, yet one which is important, in modernization. The very art of installing new meters, different in appearance, styled to modern times, would go a long way to assure the customer that the gas industry is alive and modern, that every phase of the endeavor, including the imporant one of measurement, is up to date, using every available advance in science and industry to provide the best in equipment.

Figures XI to XV reproduced from illustrations in a paper by H. Müller, "Die Trockenen Gasmesser," published in Zeitschrift des Vereines deutscher Ingenieure, Vol. 76, p. 699-704 (1932).

This 24 Sheet poster is for Utilities who wish to push not only the Magic Chef Gas Range, but also the use of gas as a fuel. Change of copy provides a poster to help dealers.

ALFRED I. PHILLIPS

CONSULTING ENGINEER

Rate Development Valuations Reports

Design Management

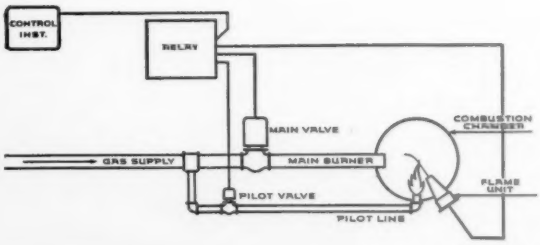
122 GREENWICH STREET NEW YORK

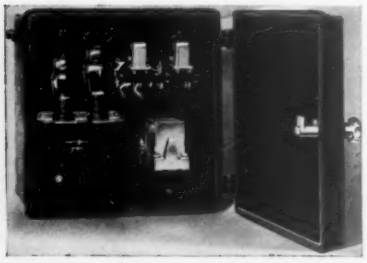
Details make perfection

FOR SEVENTEEN YEARS we have concentrated on a detail—*purification.* Today we confidently say: here is an oxide that meets the diverse requirements of diverse plants. Everything that research and large scale scientific manufacture can contribute to a material is embodied in GPM Iron Hydroxide, product of *Gas Purifying Materials Company, Long Island City, N. Y. and Providence, R. I.*

Perfection is no detail

New Equipment





RE-LITE RELAY

Brown Protectoglo

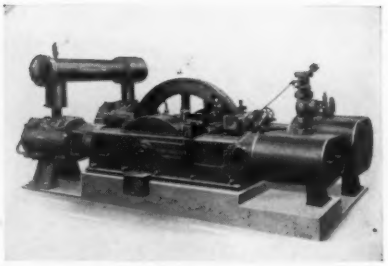
In the operation of automatic burners—where pilot flame failure might jeopardize the safety of men and equipment, Brown Protectoglo System provides protection against possible hazards of explosion and fire.

Operating on the principle of a flame conducting electrical current, the instant a pilot flame fails, the Re-Lite relay goes into instantaneous action, shuts off the fuel line tight, bringing the furnace to a full shut-down, then re-ignites, automatically, the pilot flame within a predetermined time to resume normal operations.

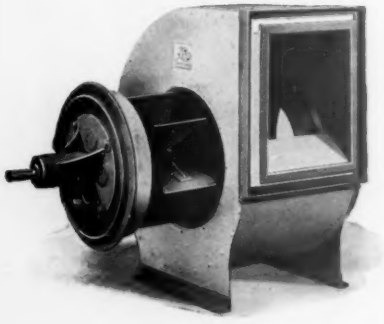
Described in Bulletin No. 92-2 of The Brown Instrument Company, Wayne and Roberts Avenues, Philadelphia, Pa.

Improved Opposed Steam-Driven Compressors

Dual cross-head design, tie-rods that maintain all piston strains exactly in line with the connecting rod, a uniform fly-wheel and counter-weighted running gears, are featured in the improved line of horizontal heavy-duty steam-driven compressors offered by Worthington Pump and Machinery Corporation, Harrison, New Jersey.



These compressors embody simple light-weight feather-type valves for which important advantages are claimed. Suction and discharge valves, located in the cylinder body, permit the full area of the cylinder head to form a water jacket, which cools the air and valves, in addition to keeping the valves free of carbon. Low power consumption is claimed because of the Admirality metal tube inter-coolers. Bulletin L-612-B3, containing complete details, may be had by writing the manufacturer.



High Temperature Exhauster

The Industrial Gas Engineering Company, 201 East Ohio Street, Chicago, Illinois, announces a new line of high temperature exhausters which embody many improvements and are manufactured in a wide range of types and sizes for various temperatures.

Convenient access to the exhauster wheels is provided, the complete assembly wheel, shaft and bearings being readily removable by the removal of the cap screws which fasten the assembly to the exhauster housing.

All new types of Thermo Exhausters are made in three stock classes, for temperatures up to 800° F., up to 1000°F., and up to 1250°F. Special units can be furnished for higher temperatures up to 1800° F.

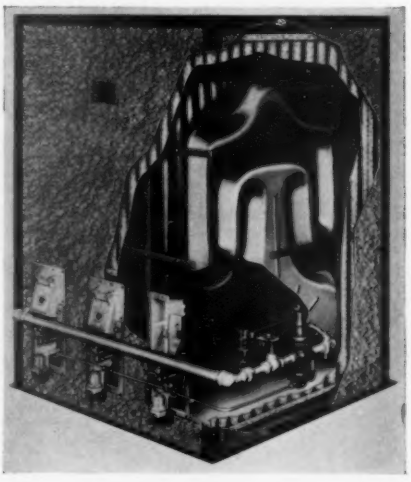
Gas Fired Furnace

A new low priced gas fired furnace with steel heating element has been announced by The Fox Furnace Company of Elyria.

The steel heating element, of unique design, is constructed of fine grade 16 gauge steel having unusually high corrosion and rust resisting properties. Long fire travel is provided by channels which convey the products of combustion over a large area of heating surface. Fox engineers claim an exceptionally high efficiency for this unit.

Casings are rectangular and are finished in green crystalline baked enamel with dark green trim. Capacities of the Series "O" shown, range from 51,000 Btu per hour at register on the 0-2 to 127,500 on the 0-5.

According to Fox officials, the attractive low price of this new unit will enable thousands, who could not afford it previously, to enjoy the benefits of automatic gas heat.



and Appliances

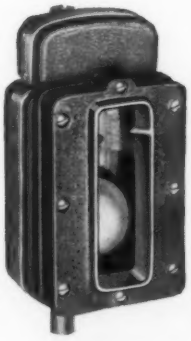
New "Niagara" Unit

In response to the general demand of small home owners for a gas-fired winter air-conditioning unit, The Forest City Foundries Company, Cleveland, Ohio, announces the New Niagara "80 AC".

In operation this unit duplicates the efficiency and economy of the larger units, being limited only in that it has been especially designed for small homes of four or five rooms, with or without basement.

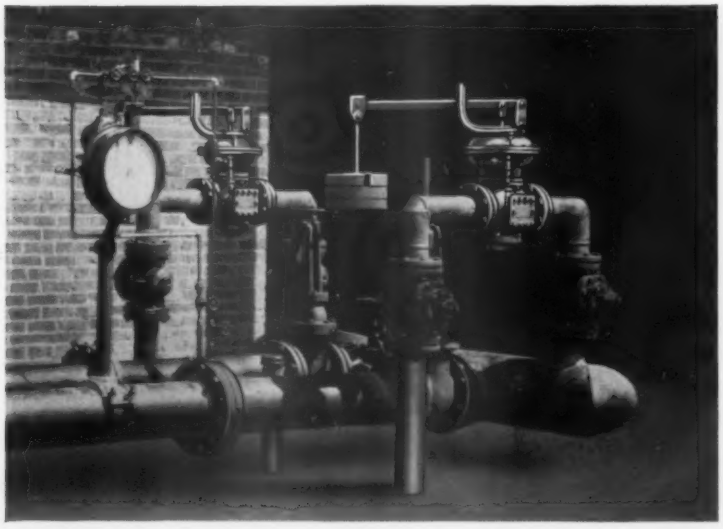
The base of the Niagara "80 AC" measures but 26 x 37"—a most important point to the small home owner who is continually confronted with the problem of conserving all possible floor space. The entire assembly can be completed, ready for gas hook-up, in twenty-nine minutes!

The same Chateau Green finish, used on the larger Niagara models, is employed to accentuate the beauty of its lines which harmonize with the dictates of modern design.



Low-Water Cut-Off

The Bryant Heater Co., Cleveland, O., announce a new line of automatic controls for gas appliances. They include combination snap valve and pressure regulator, thermal pilot, steam pressure limit control, temperature limit cut-out switch, low water cut-off, throttle control, fan switch, steam throttling control and water and air throttling control. Illustration shows the low-water cut-off, a safety device for steam and vapor systems. It cuts off burner at predetermined low water level.



Thermostats for Steam Tables

Robertshaw Thermostat Co., Youngwood, Pa., has developed an improved line of thermostats for steam tables. These controls are said to be extremely accurate and easy to install in new steam tables, as well as those already in use. Considerable savings in fuel and food are possible with the use of these new thermostats, the company claims.

While steam table temperature may vary according to conditions, there is a very definite degree of heat that will produce the best results. The balance between proper

and improper temperature is a delicate one, impossible to maintain by manual operation which depends upon guesswork. A few degrees one way or another means that the food becomes cold or over-cooked. In most cases, the latter condition prevails because the prevailing method of most kitchen help is to keep the steam table steaming, which means the water is 212 degrees and the food is cooking. This is obviously wrong, the Robertshaw Co. points out.

Reynolds Regulator

A twin installation of Reynolds news pounds to pound regulator. This type of installation provides steady volume at desired outlet pressure and offers a margin of extra volume if required. A range of inlet pressures from one pound to a thousand pounds is possible under this installation. Details may be had from Reynolds Gas Regulator Co., Anderson, Ind.

glover-west
coal gas plants

Due to continuously increasing prices of oil and the uncertainty of an adequate future supply more attention is being given to the possibilities offered by modern coal gas benches designed to meet the needs of changing conditions.

•

Glover-West coal carbonizing plants have long demonstrated their ability to make gas at low cost and produce a highly reactive coke particularly suitable for the domestic market; the tar is of low water content and suitable viscosity for road material.

•

The advanced design of installations recently built or now under construction reflects the experience gained in over 400 installations augmented by the resources of modern research and a world-wide organization.

•

WEST GAS IMPROVEMENT CO.
424 Madison Avenue New York City

HEATING BUNKER "C" OIL

for carburetting gas requires high pressure and high temperature.

ANDALE BOWED TUBE HEATERS

remain tight and are easily cleaned. These are the requirements for continuous satisfactory operation.

ANDALE COMPANY
1600 ARCH STREET
PHILADELPHIA

Maximum H_2S Removal

. . shown by careful Test!

Actual test* made by an independent authority showed that one gram of LAVINO "ACTIVATED" OXIDE, as received, removed 2.92 grains of H_2S, or a ratio of Oxide to Sulphur of 1 to 2.92 . . . as compared with a representative agent designated as Oxide "B", 1 gram of which removed only 1.49 grains of H_2S, or a ratio of Oxide to Sulphur of 1 to 1.49.

This vastly greater efficiency of LAVINO "ACTIVATED" OXIDE is an economical factor you can't afford to ignore. Get the facts; they're yours upon request and without obligation!

* A complete report of this investigation will be sent you, if you'll write us on your business letterhead.

LAVINO "ACTIVATED" OXIDE

E. J. LAVINO AND CO.
1528 WALNUT ST., PHILA., PA.
CHICAGO PITTSBURGH

Effective for Every STEAM-REDUCING PURPOSE

Whatever steam-reduction you require, there is a C-F Regulator of the Lever and Weight type to accomplish it. The regulator here shown is for low-pressure heating systems where initial pressures as high as 200 pounds must be reduced to delivery pressures of 5 to 10 pounds. Sizes of 1 to 2 inches can be provided with outlets of greater diameter.

Chaplin-Fulton Regulators have been used and approved for fifty years. Advice as to type and specification for any particular requirement will be gladly given.

THE CHAPLIN-FULTON MFG. CO.
28-40 Penn Ave. Pittsburgh, Pa.

News of the Industry

Laclede Gas Light Co. Elects New Officers

J. B. Wilson, engineer and utility executive, was elected president of The Laclede Gas Light Company by the new Laclede board and assumed the duties of this office on Monday, May 10.

Mr. Wilson began his career 25 years ago as power sales engineer for the St. Joseph Light, Heat and Power Company. He was later president of the Coast Counties Gas and Electric Company in California and comes here from the Middle West Service Company, which operates in Missouri, Kansas, Oklahoma, and Texas.

J. B. WILSON
President Laclede Gas Light Co.

The new board consists of Mr. Wilson; Ben F. Pickard, operating vice-president; John Duncan, president of the Litchfield & Madison Railway Company; L. Wade Childress, president of the Columbia Terminals Company; A. Wessel Shopleigh, vice-president and treasurer of the Shopleigh Hardware Company; W. C. D'Arcy, E. E. Pershall, and R. R. Munroe, executive vice-president of the Utilities Power & Light Corporation; M. E. Feiwell, vice-president of the American Bank & Trust Company of Chicago; Phillips B. Shaw, consulting engineer, and A. L. Jackson.

There is also a provision for a board chairman, but it was said this post will be left vacant indefinitely. Officers elected besides Wilson and Pickard are: John Duncan, vice-president; E. L. White, secretary and treasurer; and Alfred Hirsh, assistant secretary and treasurer.

Mr. Childress is chairman of the Executive Committee, whose other members are, Pershall, Shopleigh, Jackson, and Feiwell.

The new president in a recent interview stated that one of his main objectives would be to make The Laclede Gas Light Company a "St. Louis Institution." He said that he wished to give careful consideration to rates, the possibilities of a wider use of natural gas, and conciliation and cooperation with the city.

CONVENTION CALENDAR

June

8-9—American Gas Ass'n, Industrial Gas Section, Industrial Gas Sales Conference, Chicago, Ill.
10-11—New York-New Jersey Regional Gas Sales Conference. Westchester Country Club, Rye, N. Y.
10-11—Canadian Gas Association, annual convention, Chateau Laurier Hotel, Ottawa, Canada.
11-16—International Gas Union, Paris, France.
15-19—Home Service Training Course, A.G.A. Testing Laboratories, Cleveland, Ohio.
Week of 20th—Findlay's Golden Celebration of Oil and Gas, Findlay, Ohio, Harry Botsford, manager.
20-23—Public Utilities Advertising Association, annual convention, Hotel Pennsylvania, New York, N. Y.
21-24—American Home Economics Association, Kansas City, Mo.
24—New England Gas Association, Accounting Division dinner meeting, Springfield, Mass.
24-26—American Society of Heating and Ventilating Engineers, New Ocean House, Swampscott, Mass.
June 28-July 2—American Society for Testing Materials, Waldorf-Astoria Hotel, New York, N. Y.

July

1-3—Michigan Gas Association, Grand Hotel, Mackinac Island, Mich.

September

Week of 27th—American Gas Association, annual convention, Cleveland, O.

Annual Convention of the Missouri Association of Public Utilities

Chester C. Smith, vice-president of the Kansas City (Mo.) Power and Light Company, was elected president of the Missouri Association of Public Utilities at its annual convention April 21, 22 and 23 in Excelsior Springs, Mo. He succeeds C. E. Michel, vice-president of the Union Electric Light and Power Company, St. Louis, Mo., who has served as president two years.

Other officers elected were: First Vice-President, E. H. Lewis, St. Louis County Gas Company, Webster Groves, Mo.; Second Vice-President, Ben C. Adams, Gas Service Company, Kansas City, Mo.; Third Vice-President, O. F. Funk, Union Electric Light and Power Company, St. Louis, Mo.; Secretary, N. R. Beagle, Missouri Power and Light Company, Jefferson City, Mo.; Treasurer, Hermann Spoehrer, Union Electric Light and Power Company, St. Louis, Mo.; Assistant Secretary, Jesse Blythe, Jefferson City, Mo.; Managing Director, E. A. Beer, Jefferson City, Mo.

A State Speaking Contest was held on the evening of April 21 at which employees of all member companies were eligible. Eight electric and gas companies sent contestants. The subjects were: For women—"Creating Satisfied Customers"; for men—"Service—Today's Greatest Opportunity." The winners were: Women—First prize, Miss Jane Bryden, Laclede Gas Light Company, St. Louis; second prize, Miss Frances Lewis, Kansas City Power and Light Company, Kansas City; men—First prize, Carl V. Hansen, Union Electric Light and Power Company, St. Louis; second prize, Alvin C. Singer, Kansas City Gas Company, Kansas City.

The prizes were: First prize in both men's and women's classes, $50 in cash; second prize in each, $25 in cash. All other contestants received desk lamps as prizes in appreciation of their efforts.

Public Utilities Advertising Assn. Meeting June 22

Thomas H. Spain, chairman of the program committee for the 1937 convention of the Public Utilities Advertising Association, announces a one-day meeting to be held at the Hotel Pennsylvania, New York, Tuesday, June 22. This meeting is in connection with the annual convention of the Advertising Federation of America.

N. Henry Gellert, Elected President Great Lakes Utilities Co.

The Great Lakes Utilities Company, a new holding company, has taken over all the subsidiaries formerly owned by the Great Lakes Utilities Corporation, which was reorganized in the Federal Court. The new company is a registered public utility holding company, and its applications and declarations have been approved by the Securities and Exchange Commission.

The company has acquired the following subsidiaries of the old corporation:

Ohio Gas Light and Coke Company, which has an artificial gas plant in Bryan, Ohio, and supplies several of the neighboring communities, including Wauseon and Napoleon, and also has a natural gas property at Millersburg, Ohio, which supplies Millersburg and Killbuck with natural gas. A large portion of the company's supply at Millersburg comes from its own wells.

Gas Corporation of Michigan, which has an artificial gas plant at Greenville, Michigan, and another one at Ludington, Michigan. It also has a natural gas property at Mount Pleasant, Michigan, which supplies not only Mount Pleasant, but also Clare and Rosebush. This property produces in the Vernon and Clare fields.

Rochelle Gas Company, an artificial gas property in Rochelle, Illinois.

Paxton Gas Company, an artificial gas property in Paxton, Illinois, which also supplies Gibson City and Rantoul.

Independence Gas Company, an artificial gas property in Independence, Iowa.

Peoples Gas and Power Company, an artificial gas property in Chariton, Iowa.

LeMars Gas Company, an artificial gas property in LeMars, Iiowa.

Watertown Gas Company, an artificial gas property in Watertown, South Dakota.

Virginia Gas and Utilities Company, with two butane plants—one in East Radford, Virginia, and the other in Pulaski, Virginia.

Martinsville Gas Company, a butane property in Martinsville, Virginia.

The contract for the operation of these properties has been given to Day Zimmerman, Inc.

N. Henry Gellert has been elected president of the holding company.

Directory of Approved Appliances

Supplementary Bulletin of May 1st published by American Gas Association Testing Laboratories lists appliances approved during April, 1937. On July 1st, 1937, and every third month thereafter a complete directory of all approved appliances and accessories will be issued with supplementary lists for the intervening months.

Completes 64 Years of Service

Edward Olsen, head of the Meter Installation and Customers' Service Department of the Citizens Gas and Coke Utility, Indianapolis, Ind., recently completed his 64th year of continuous service with this organization.

"Pop" Olsen is 83 years of age and still is active and in remarkably good health.

He was born in Denmark on the island of Falster near Nykebing. He came to America when he was 18 years of age and worked in a saw mill near Indianapolis for a short time. In November, 1872, he went to work in the plant of the Indianapolis Gas Company where two brothers were working. The plant was being remodeled and the first job was to erect stand pipes to the benches, erect hydraulic main and make the necessary connections with the holder. He was told that his work would be temporary, but for three years he worked in the plant during the winter and in the summer time assisted in laying mains in the streets.

EDWARD OLSEN

In 1875 he was transferred to the office where he read meters, set meters and took care of complaints, for a number of years. After the city grew, he was in charge of all meter and customer service work as well as looking after the stock of gas in the holders. It was necessary to fill two outlying holders at night, and Mr. Olsen's sleep was taken in installments between frequent phone calls to the men on the holders.

He always stood up for his men. He never hesitated to give them a calling down, but he never allowed any one else to criticize one of his employees.

Mr. Olsen has served under five managers and has seen the number of meters in Indianapolis increase from 3,000 in the days when he personally answered all fire alarms—no fire department horse could outrun his; no driver was more skilled or picturesque—to more than 80,000.

American Welding Society Appoints Warner S. Hays Manager

A. E. Gibson, President, The American Welding Society, 33 West 39th Street, New York, N. Y., announces the appointment of Warner S. Hays as manager. Mr. Hays brings to the Society an unusual combination of experience and background in engineering, sales, publishing, membership development and association management. During the past six months six hundred new members have been appointed and several new local chapters established. Within the coming year it is anticipated that the total membership will be increased nearly 100% and the number of local chapters doubles the present figure.

Pacific Gas & Electric Company Cooperates With Dealers

In northern and central California, under leadership of the Pacific Gas and Electric Company, sales and advertising unite this year in more of a cooperative industry promotion than ever before. Meetings of dealers and manufacturers and their representatives have been held all over the system and promotion concentrations for every month of the year agreed upon, June will be devoted to the automatic gas water heater, July and August, gas heating, September, washers and ironers, October, radios and gas ranges, and November, gas heating.

A.G.P. Corporation Purchases Ensign-Reynolds Inc.

American Gas Products Corporation, a subsidiary of American Radiator & Standard Sanitary Corporation, has purchased from Consolidated Edison Company the Ensign-Reynolds, Inc., manufacturers of industrial gas equipment.

Through the acquisition of this company, American Gas Products Corporation has materially broadened its line and will now be prepared to serve industrial companies with various types of industrial gas burning equipment such as Gas Filters, Ribbon Burners, Inspirators, Air Cleaners, Flame Distributors, Gas Compressors, and special burner tips used in the printing, baking, plastic, dye, and many other industries.

Oven Heat-control Display

An illuminated display for counter, show room, or window use has been prepared by Robertshaw Thermostat Co. of Youngwood, Pa. Made of heavy ply-board the display has cut out lettering in red and black with a metallic gold front measuring 15 by 7 inches and a depth of 4½ inches. Electric bulb in the shadow box has 90 inch silk gold cord with socket and plug. Available through the manufacturer at a nominal sum.

Electrolux Drive a Success

As a result of the success of the special sales campaign for Electrolux gas refrigerators during April, plans are now under way for a similar drive in the Fall, E. F. Jeffe, vice-president in charge of sales of the Consolidated Edison Company of New York, Inc., announced. The original goal of 5,000 units was exceeded by 3,192, a total of 8,192, which compares with 1,437 sold in the like period of 1936, and with 15,279 sold in the company's gas territory the entire year 1936. A total of 296 dealers cooperated. Intensive newspaper advertising was the backbone of the drive, with radio also used.

Roper Uses Sound Film

The Geo. D. Roper Corporation of Rockford, Ill., announces a sensational new modern step in Gas Range selling, a dramatized method of making sales through a sound film.

The first show is "Sunshine In the Kitchen." It forcefully puts the sales story over into the mind of every prospect.

The sound film is a recently popularized development which makes it possible to show photographs upon a screen and to accompany them with sound. In this way a character can be shown portraying a certain action and her voice can be reproduced to make the photograph seem very real and lifelike.

The talking slide film method of selling is not an experiment. One large firm has 8,000 dealers and salesmen equipped. Another 5,000. Others 2,000, 1,000, 500, and lesser numbers.

The equipment is portable, light, completely self-contained. It can be set up in a minute, and anybody can operate it, as simply as operating a phonograph.

Lincoln Arc Welding Foundation

Robert S. Hale, 1008 Atlas Bank Building, Cincinnati, has the distinction of submitting the first paper in competition for the $200,000 awards of The James F. Lincoln Arc Welding Foundation, according to A. F. Davis, Foundation secretary, Cleveland, Ohio. Mr. Hale is an architect and structural engineer and holds the position of construction engineer, Procurement Division, Public Buildings Branch, United States Treasury Department.

Although the actual contents of Mr. Hale's paper will not be known until the paper is delivered to the Jury of Awards, June 1, 1938, with all other competing papers, the subject of the paper relates to the construction field in which the use of electric welding has made marked progress in recent years.

Ditching Avoided

Unusual feats of engineering have marked the construction of San Francisco's famous Golden Gate Bridge from its very beginning. During the present rush toward early completion of the work, a problem of installing a gas service connection across the north approach to the bridge was met in an interesting manner by the Pacific Gas & Electric Company.

Heavy trucking of bridge supplies over the bridge approach made traffic interruption out of the question. Detouring was also impossible for no other roads could be built on the narrow strip of land between the ocean and foothills.

Pacific Gas and Electric Co. meets a gas service installation problem by boring beneath pavement.

The utility company dispatched one of its Hydrauger-equipped service trucks from a nearby city and bored across beneath the pavement. The distance of 36 feet was penetrated in 28 minutes after the Hydrauger commenced drilling.

The bore was directed by means of sighting targets to enter a concrete service box but 14 inches wide. The pilot bit of the machine entered the box almost at its exact center.

Mercoid Appoints New Salesmen

Completing a comprehensive training course in the factory, Mr. R. M. Keatts and Mr. J. F. McCauley have recently been transferred to the sales organization of The Mercoid Corporation, 4201 Belmont Avenue, Chicago, Illinois. Mr. Keatts will work out of the Cincinnati, Ohio, office, and Mr. McCauley will confine his sales efforts to the Cleveland, Ohio, area.

The sales training course of The Mercoid Corporation is similar to many apprentice courses offered shop employees by manufacturing organizations. These men are thoroughly informed on all manufacturing, technical and application phases of Mercoid Automatic Controls for heating, air conditioning, refrigeration and for general industry.

Bryant Announces 1937 Gas Heating Campaign

The Bryant Heater Company, Cleveland, O., has announced the publicity and merchandising plans for the 1937 gas heating season.

National advertising to consumers will be carried in several popular magazines, beginning at once.

A campaign to promote Bryant's Silica Gel Dehumidifier for use in industrial dry-air processing and comfort conditionings starts in May and architects will be urged to specify gas heating in a series of advertisements starting in June.

Gas company and dealer tie-up material for the pre-selling activities have been announced in an attractive portfolio just released. These materials consist of an interesting series of rotogravure mailing pieces. There are four of these pieces. They are gotten up in miniature tabloid newspaper style, and bear the masthead—"the Comfort Courier." The little newspapers are profusely illustrated, with short stories written in a breezy, semi-humorous style, with each story packing a gas-heating selling punch.

Koppers Engineering Division Modernizes Two Plants

Contracts for the remodeling and modernization of two liquid purification plants have just been awarded to Koppers Company's Engineering and Construction Division.

The purification plant of the Hudson Valley Fuel Corporation at its coke oven gas plant in Troy, N. Y., will be changed over to the Koppers-Thylox process from the Koppers-Seaboard process. Capacity will be increased from 18,000,000 to 24,000,000 cubic feet a day.

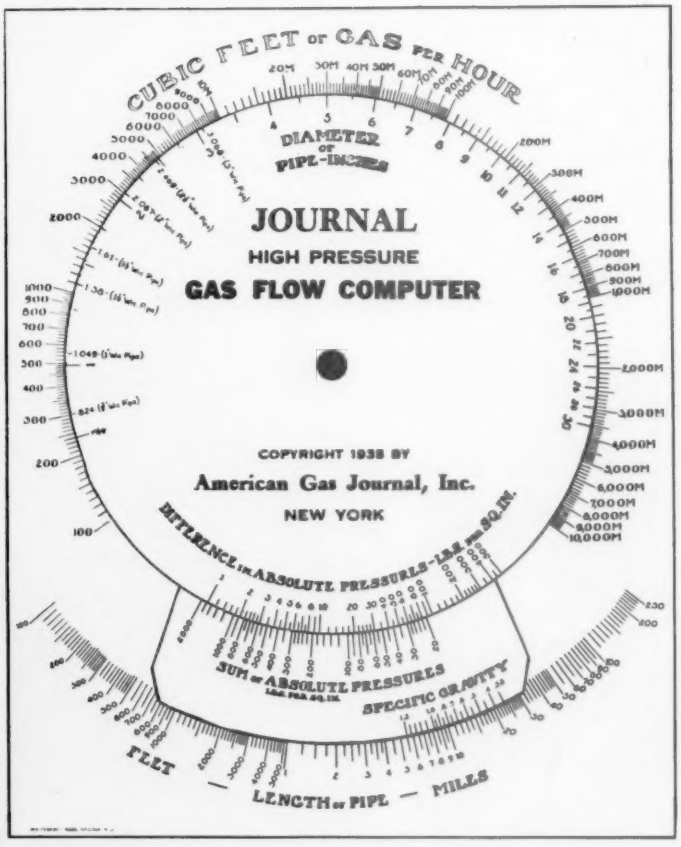
The Rochester Gas and Electric Corporation's Koppers-Thylox plant at its coke oven and water gas generating station in Rochester, N. Y., will be modernized. This equipment has a capacity of 20,000,000 cubic feet a day.

Engineering work on both contracts has been started. Construction will begin on both jobs in about six weeks. The Troy plant will be completed in October, and the Rochester plant in September.

Water Heaters

The Hotstream Heater Co. is distributing a new 24 page catalog, No. 37, illustrating and describing their complete line of gas-fired water heaters. Tables of ratings and capacities are given. Thermostats, relief valves and other accessories are shown in detail. Curves are plotted to show method of figuring natural or manufactured gas consumption based on degree rise of water temperature and a series of useful tables pertaining to water heating are included. Copies may be had by addressing the company, 8007 Grand Ave., Cleveland, Ohio.

"Journal" Gas Flow Computers



New Improved Gas Flow Computers now available of durable celluloid, encased in a convenient leatherette cover with complete instructions.

Actual Size 6¼ x 7½

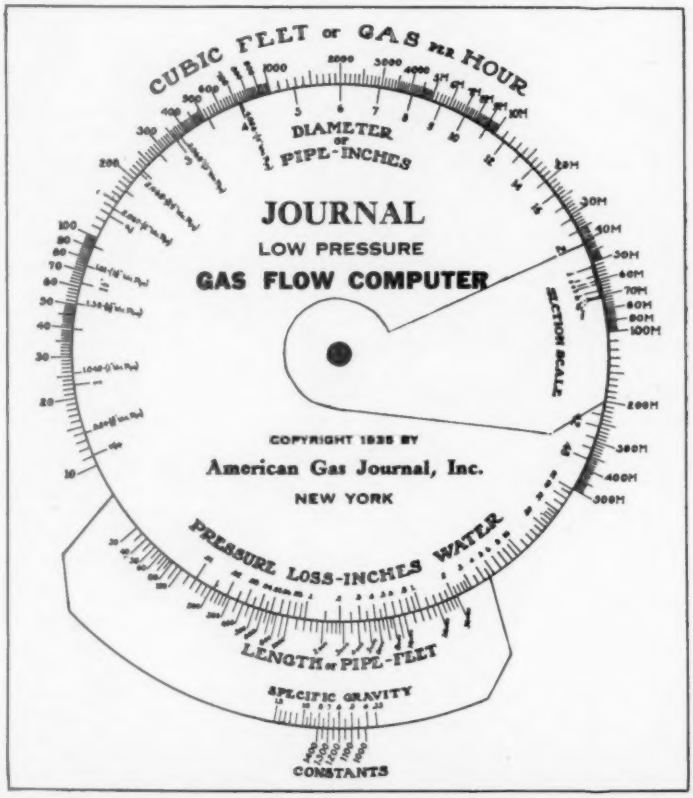
High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure Computer Range:

Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter ¾" to 48" (including standard and actual weight up to 4")
Pressure Loss Inches .01-10.
Length of Pipe—Feet 30-30,000
Specific Gravity 1.5-.35
Constants 1400-1000

Price $3.50 Each, Postage Prepaid



AMERICAN GAS JOURNAL
53 Park Place, New York

Please enter our order for Computers as follows at $3.50 each, postage prepaid

....HIGH Pressure Computer

....LOW Pressure Computer

NAME .....

ADDRESS .....

Obituary

MERTON C. ROBBINS

Merton Covey Robbins, chairman of the Robbins Publishing Company, New York City, died of a heart ailment in the Harkness Pavilion of the Columbia-Presbyterian Medical Center May 20th. He was 62 years old. His home was at 134 Cliff Avenue, Pelham, N. Y.

Born in Brattleboro, Vermont, he graduated from the University of Vermont in 1898, receiving a B.S. degree in civil engineering.

After starting as western representative of Engineering News in 1899, Mr. Robbins' rise was rapid. By 1910 he was general manager of Iron Age, a position which he held for eight years. In 1918 he started in the publishing business for himself, purchasing Gas Age and Brown's Directory of American Gas Companies. With these publications he founded the Robbins Publishing Company.

MERTON C. ROBBINS

Mr. Robbins was actively interested in all of the publishers' associations and lent his efforts to everything which would raise the standards of business publications in general.

While president of the New York Trade Press Association, he wrote a clause into the constitution of that body requiring that publishers supply advertisers with verified circulation information. From this beginning grew the Audit Bureau of Circulation, of which Mr. Robbins was one of the founders.

He was president of the New York Business Publishers Association in 1915-16; president of the Associated Business Paper, Inc., in 1920-21; and a director of the National Publishers Association for many years.

FRANK E. NEWBERRY

FRANK E. NEWBERRY

Frank Ernest Newberry, 64, retired public utilities executive, died May 19th at his home, 321 Garfield Avenue, Avon, N. J., after a lingering illness. Mr. Newberry's career led him from the practice of law in Chicago to a position with the Peoples Gas Light and Coke Company, Chicago, and then to the managership of the Citizens Gas Company of Kankakee, Ill.

Eight years after his appointment, the Kankakee Company was sold to the Insull interests. Mr. Newberry continued with the new owners as manager of the Dixon, Ill., and Green Bay, Wis., plants.

During the World War, Mr. Newberry acted as a purchasing agent with the government. He was in Europe for a year and later was in charge of the purchase of the $20,000,000 shipyard at Port Newark.

More recently Mr. Newberry served as New York manager of the Equitable Meter and Manufacturing Company and his last post was with the Reynolds Gas Regulator Company.

He was a member of the American Gas Association and a charter member and one-time secretary and treasurer of the Illinois Gas Association.

HARRY E. KERR

Harry E. Kerr, 57 years of age, who for the past 19 years was president of the Barber Gas Burner Company, Cleveland, Ohio, died May 7 in the Anglo-American Hospital in Havana, Cuba.

Mr. Kerr was born September 6, 1880, in Oshawa, Ontario, Canada, and is survived by his mother, Susan E. Kerr of Windsor, Ontario, Canada; three brothers, Arthur, Edward and Garnet, and one daughter, Dorothy E. Manuel of Shaker Heights, Cleveland, Ohio.

During the early period of his life, he was connected with various brass foundry and manufacturing companies, later a partner of the Kerr-Bailey Company, handling special investigations and dictograph work.

He organized the Cleveland Gas Burner & Appliance Company in 1918, manufacturing the Barber Gas Burner, which Company was re-organized under the name of the Barber Gas Burner Company in 1930.

He was president and active head of the Burner Company and probably the most widely known individual in the gas appliance manufacturing field, being the pioneer in developing conversion gas burners and their application to coal-fired design heating appliances.

HARRY E. KERR

Mr. Kerr had been steadily failing in health for the past year and on March 16, 1937, was required to give up active work. On May 1, he sailed for Havana, Cuba, where he felt the hot sunshine would enable him to recuperate but was compelled to go to the Anglo-American Hospital immediately upon his arrival, and on May 7, pneumonia set in resulting in his death on the same day.

His body was returned to Cleveland for funeral services and interment was made in Detroit, May 12.

The Company will continue operations without any change in personnel.

MAYNARD H. SPEAR

Maynard H. Spear, who was associated with the Consolidated Edison Company of New York, Inc., for many years, died on May 19th at the Fifth Avenue Hospital. Mr. Spear underwent an abdominal operation last week.

Mr. Spear was president of the New York and Queens Gas Company from 1928 until June, 1936, when the company was merged into Consolidated Edison. Since then he has been manager of the Queens district of the company.

He was born in Brooklyn, N. Y., on March 29, 1874, and attended Brooklyn Polytechnic Institute and Stevens Institute of Technology.

His first job was with the Bayonne Chemical Works, specializing in the manufacture of nitric and sulphuric acids for the production of nitroglycerine. In 1896 he entered the employ of The Standard Gas Light Company of the City of New York as foreman, staying there until 1899 when he went with the Hornell Gas Light Company, at Hornell, N. Y. In 1902 he became superintendent of the Newtown and Flushing Gas Company at Flushing, which was merged with the New York and Queens Gas Company in 1904. In 1906 he became manager of the company, in 1908 secretary and general manager, in 1920 vice-president, in 1924 a director, and in 1928 president.

Mr. Spear was a past president of the Society of Gas and Electric Accountants; a member of the American Society of Mechanical Engineers and the American Gas Association.

HENRY H. SPRAGUE

Henry H. Sprague, founder and chairman of the board of the Sprague Meter Company of Bridgeport, Conn., died on May 29th at his home of a heart ailment. He was 79 years old.

Mr. Sprague, a native of Newark, Ohio, was graduated from Yale in 1881.

For a short time he was a surveyor for the first telephone lines in Central Ohio and in 1888 he purchased rights to a gas meter, which he soon discarded as impractical. He then invented one of his own, the first cast-iron meter for artificial gas. In 1890 he set up a two-man plant in Bridgeport. It now employs 200 men. He was a director of the Black Rock Bank and Trust Company since its founding.

Central Foundry Co. Moves Office

The Central Foundry Co. announces the removal of its New York office from 420 Lexington Ave., to 386 Fourth Ave., effective June 1st.

Rochester Gas & Electric Co. Issues Bulletin

"Gas Manufacture and Distribution" is the title of an attractive and well illustrated bulletin describing the properties of Rochester Gas and Electric Co., and the operations at its three gas plants. It shows also its laboratories and lists and describes its products. A flow chart of gas manufacture is included.

New Insulating Brick

Johns-Manville has recently placed on the market a new type of 2000-degree insulating brick known as "JM-20."

This new brick is for use behind refractory walls in various types of high temperature industrial equipment, including boiler settings, ceramic kilns, steel plant equipment, and practically all types of furnaces. It can also be used for direct exposure at temperatures up to 2000-degrees F. wherever there is no flame impingement, slag action or mechanical abrasion. It is unusually light in weight, weighing less than 1.7 lbs. per standard 9-inch equivalent. Its heat capacity is less than one-quarter that of ordinary refractories—and its thermal conductivity is less than one-sixth that of fire brick.

Transite Pipe for Water Service

The National Board of Fire Underwriters has issued a report of approval on Transite Pressure Pipe and couplings in sizes from 4 to 24 inches, inclusive, for use in underground water service where the working pressure does not exceed 150 lb. per square inch.

The complete report, full information about which may be secured from Johns-Manville, 22 East 40th Street, New York City, was compiled after months of thorough investigation and tests of this asbestos cement product which has a twenty year record of service in Europe and which, since its introduction by Johns-Manville in 1928, has been installed in hundreds of municipal and industrial water distribution systems in the United States and Canada.

INDUSTRIAL GAS BOILERS

Tubular or Flueless

¾ to 45 H.P.

P. M. LATTNER MFG. COMPANY

CEDAR RAPIDS, IOWA

Panhandle Eastern to Use Dressers

For use on their new looping program in Kansas, Missouri, and Illinois, the Panhandle Eastern Pipe Line Co. has ordered a total of almost 17,000 Dresser Couplings, according to M. N. Davis, Vice-President of the S. R. Dresser Manufacturing Co., Bradford, Pa. Approximately 14,500 of these are in the 24 inch O.D. size and the remainder are in the 22 inch O.D. size. In addition, nearly 250 Style 40 Long Sleeves in similar sizes are being supplied. Total mileage of the eight loops to be constructed will amount to about 216 miles of 24 inch and 39 miles of 22 inch pipe.

Brown Meter Catalog

The Brown Instrument Company has just published a new catalog on Brown CO_2 Meters No. 3005 which covers the complete line of Brown Indicating and Recording CO_2 Meters as well as the combined CO_2 and Flue Gas Temperature Recorders.

A schematic diagram on pages 12-13 illustrates the operating principle of the Brown CO_2 Meter and describes the passage of the flue gas through the various units.

Copies may be had by addressing The Brown Instrument Company, Wayne & Roberts Avenues, Philadelphia, Pa.

Protective Coatings for Industrial Use

The Wailes Dove-Hermiston Corporation, 17 Battery Place, New York, announces a complete line of protective coating for industry. These products are being marketed by the Industrial Division, under the direction of Julio F. Sorzano.

Items in the line are Bitumastic Black Solution and Bitumastic Super-Service Black, which have been used in maintenance work for many years; Chromastic Aluminum Paint—a new product with a rust-inhibiting vehicle, identified by the opaque yellow color (of the vehicle); Bitumastic Exterior-Interior Paint—a general all-purpose coating; Florex Floor Enamel; Bitugloss Industrial Enamel, for machinery and equipment; Thermastic High Heat Aluminum; Chromastic Metal Primer and Bitulite Mill White.

In 1896 Bitumastic products were introduced in the United States by Mr. James Hermiston, who carried on the business with American control and management under the name of the American Bitumastic Enamels Company. The company continued to specialize in marine coatings, and at the same time, developed products and application machinery for the then entirely new field of coatings for underground pipe lines.

The company continues to develop new products from time to time and, to this end, a modern research laboratory has been established at Garwood, N. J.

INDEX TO ADVERTISERS

Alpha Lux Co., The	8	Lincoln Electric Co.	—
American Meter Co.	10	Martin Oven Co.	60
American Stove Co.	52	McWane Cast Iron Pipe Co.	66
Andale Company	76	Merco-Nordstrom Valve Co.	27–28
Appalachian Coals, Inc.	62	Metric Metal Works	10
Barber Gas Burner Co., The	61	Minneapolis-Honeywell Regulator Co.	7
Bartlett Hayward Division, Koppers Co.	4–5	Mohawk Asphalt Heater Co.	84
Bismarck Hotel	61	National Tube Co.	—
Blaw-Knox Company	68	Alfred I. Phillips	73
Cast Iron Pipe Research Assn., The	6	Pittsburgh Equitable Meter Co.	Front Cover
Chace Co., W. M.	67	Pittsburgh Water Heater Co.	—
Chaplin Fulton Mfg. Co., The	76	Remington Rand, Inc.	—
Cleveland Trencher Co.	—	Reynolds Gas Regulator Co.	62
Connelly Iron Sponge & Governor Co.	—	Robertshaw Thermostat Co.	59
Cooper-Bessemer Corp'n.	—	Roberts-Gordon Appliance Corp'n.	61
Cruse-Kemper Co.	67	Roper Corp., Geo. D.	—
Dresser Mfg. Co., S. R.	3	Safety Gas Main Stopper Co., Inc.	68
Engineering and Construction Division of Koppers Co.	4–5	Semet Solvay Engineering Corp.	2
Forest City Foundries Co.	85	Servel Electrolux Div.	48–49
Gas and Coke Division of Koppers Co.	4–5	Skinner Co., M. B.	43
Gas Purifying Materials Co.	73	Sprague Meter Co., The	Back Cover
Glenwood Range Co.	57	Stacey Bros. Gas Construction Co.	—
Hays Manufacturing Co.	68	Superior Meter Company	36
Improved Equipment — Russell Engineering Corp.	83	Tar and Chemical Division of Koppers Co.	4–5
Isbell Porter Co.	83	Titan Valve & Mfg. Co., The	67
Johnson Gas Appliance Co.	67	United American Bosch Corp.	55
Kitson Company	—	United Engineers & Constructors, Inc.	31
Lambert Meter Co., Inc.	68	Western Gas Division of Koppers Co.	4–5
Lattner Mfg. Co., P. M.	82	West Gas Improvement Co.	76
Lavino & Co., E. J.	76	Wood Preserving Corp., The	—
		X-Pando Corporation	—

ISBELL-PORTER COMPANY

Engineers and Contractors for Complete Gas Works

I-P C

Manufacturers of All Kinds of Gas Apparatus

NEWARK, NEW JERSEY

IMPROVED EQUIPMENT — RUSSELL ENGINEERING

Coal Gas Plants—Horizontal Ovens, Benches, Refills, Additions, Repairs, Charging and Discharging Machines

DIVISION OF
COMBUSTION UTILITIES CORPORATION
24 STATE STREET
NEW YORK

Oil Gas Plants—"Refractory Screen" Process for Base—Standby or Peak Loads—On Existing or New Water Gas Sets Low or High B.T.U. Gas

Public Utility Standpoint on Credit Merchandising

Public utility credit executives are to meet at the Stevens Hotel, Chicago, for a series of conferences, June 21-24, during the Credit Congress of Industry, which is to be held as a part of the 42nd Annual Convention of the National Association of Credit Men.

R. W. Forwood, Consumers Power Company, Grand Rapids, is national chairman of the group.

Discussion will be concentrated on credit subjects, particularly affecting public utilities. One of them is "Merchandise Credit From A Public Utility Standpoint." How this differs from policies of firms privileged to select their own customers is pointed out by Charles Davies, San Diego Consolidated Gas & Electric Company, San Diego, Calif., who says that Public Utility merchandising presents a distinct problem from a credit and collection standpoint.

Whereas credit and collection methods for the sale of gas, electricity and water have been fairly well standardized, policies pertaining to the sale of merchandise differ in virtually every company. This may be due to the management of a given company or it may reflect the personality of the credit manager.

A department store engaging in credit sales of merchandise has the privilege of selecting its customers. It may accept or decline any account without fear of criticism. It may give extended terms or make allowances. Their only responsibility is to their store. Losses are absorbed by the store. A disgruntled customer may trade elsewhere. The utility is confronted with an entirely different aspect. They may not select their customers nor extend preferred terms without criticism. So the policy of merchandising does become a problem.

Many utility companies extend credit on merchandise to any customer using company service. Unless a vigorous campaign of repossession is used to enforce payments many accounts become delinquent. This action presents another problem. The sales department will argue that repossession will result in a loss of revenue from the sale of the company service. If the merchandise is not repossessed on a delinquent account there is discrimination. Like the question of which came first the egg or the chicken, the argument goes on and on.

The answer is plain. The merchandising policy of any utility must be based on a substantial foundation of that which produces the greatest profit and the best public relations. Applicants for credit should be checked for antecedent information and only those people who have established a satisfactory record should be extended the privilege of an open account. This means the rejection of many accounts and therefore the elimination of most of the collection expense.

In sustaining the above thought let us examine the result of selling merchandise without adequate information. If an article is sold for ten dollars on a one year contract it only requires three delinquencies during the year that require a call by the collector to destroy the profit made on the original sale. But let us take a larger item. Suppose an appliance is sold on a three year contract for three hundred dollars. After the purchaser has made a few payments his equity becomes such that no one would wish to repossess if there is any way to avoid such a procedure. So the account becomes an involved one, necessitating both additional bookkeeping and collection expense.

What of public relations if credit terms are denied some people? Experience teaches that a customer will become more embittered by a visit from a collector than ever became angry over a statement by a credit manager that his information did not warrant the extension of credit. One might as well explain at the outset as jeopardize a good utility service account by needed collection treatment on the merchandise account.

Every company engaged in the sale of a utility will have on their books at least sixty per cent of their customers who have paid their accounts promptly for a considerable period of time. What better prospects for the sale of merchandise than these? One company in our section sends out their salesmen to look over the premises to determine whether the prospective sale is a wise one. Predicting sales on such a decision tends to destroy the profession of credit executive.

Credit has been greatly abused over our entire country. Most of the blame attaches to over-enthusiastic managements who apparently are so unwilling to risk a competitor gaining a sale that credit is granted without investigation. If credit standards are raised the public will become better informed and educated on their purpose and billions will be saved the retail merchants in the United States. What a wonderful field for utilities to lead the way!

WANTED

ANY QUANTITY OF

GAS RETORT CARBON

FOR PROMPT AND LATER DELIVERY

Address Box 104 c/o American Gas Journal

53 PARK PLACE NEW YORK

MODERNIZE WITH MOHAWK PRODUCTS

ALL STEEL TOOL AND SUPPLY TRAILERS FOR GAS AND ELECTRIC COMPANIES

MOHAWK HI-SPEED TRAILER

HOTSTUF BITUMEN HEATERS

LEAD AND COMPOUND MELTING POTS

Hotstuf

MOHAWK ASPHALT HEATER CO.

SALES POSITION OPEN

An Industrial Appliance Manufacturer's Representative in the east has an opening for an assistant. Must be capable of visiting prospects with car. Exclusive territory available. Commission basis. Address Box 105, c/o AMERICAN GAS JOURNAL.

The New NIAGARA Eighty

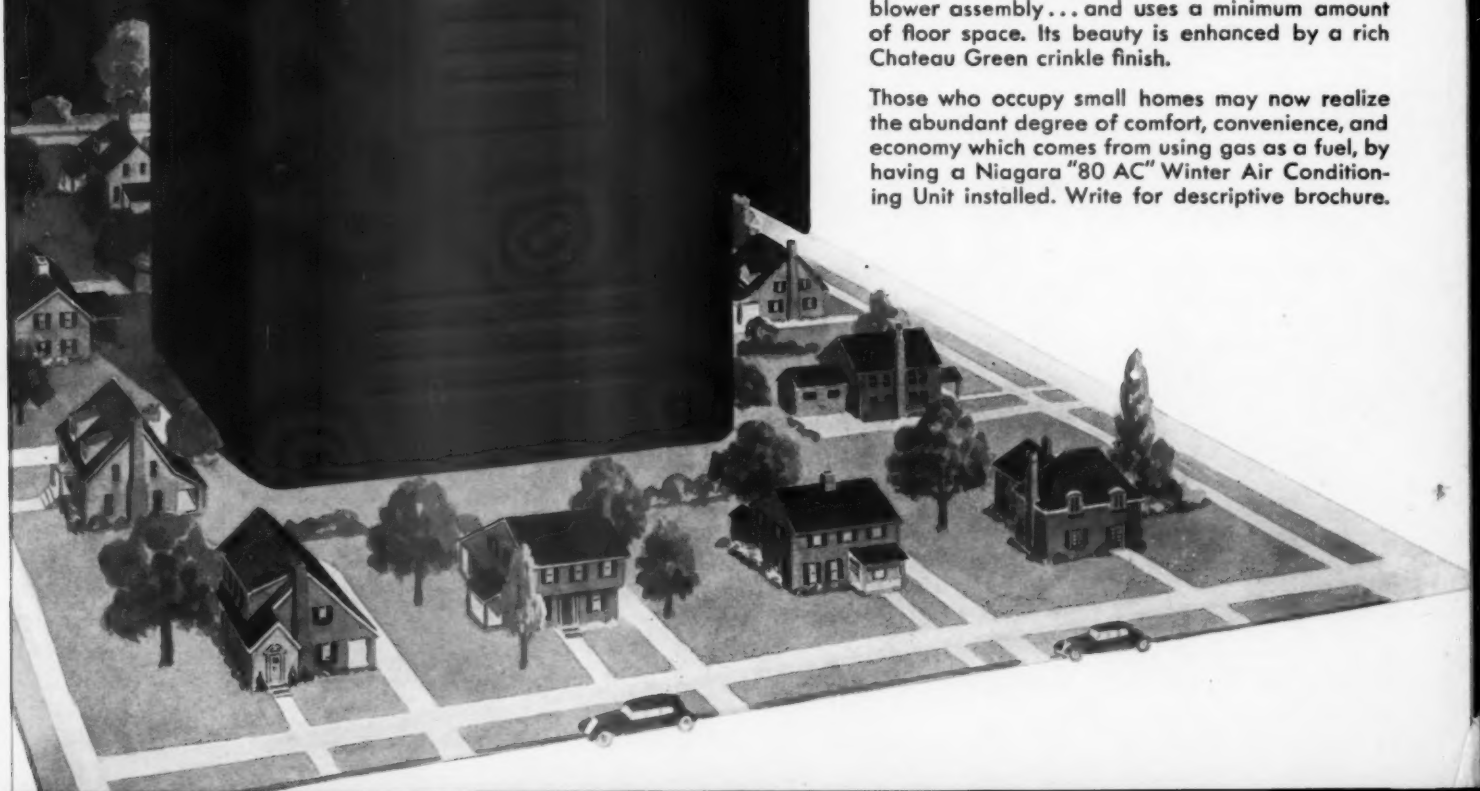
WINTER AIR-CONDITIONING UNIT

● The New Niagara "80 AC" represents the result of the effort of Niagara heating engineers to bring to owners of small homes the convenience, freedom, and cleanliness which emphasize the desirability of gas as a fuel.

The Niagara "80 AC" Winter Air Conditioning Unit presents an extremely compact assembly of heating elements, blower, filter, and humidifier, logically arranged in relationship to each other, and precisely regulated for smooth operation. The combustion chamber and radiating sections are of cast-iron. The blower is belt driven with adjustable pulley. The return air inlet is conveniently located in the rear, at floor level.

The cabinet of the Niagara "80 AC" has simple and symmetrical lines . . . permits ready access to all controls . . . completely envelopes the compact blower assembly . . . and uses a minimum amount of floor space. Its beauty is enhanced by a rich Chateau Green crinkle finish.

Those who occupy small homes may now realize the abundant degree of comfort, convenience, and economy which comes from using gas as a fuel, by having a Niagara "80 AC" Winter Air Conditioning Unit installed. Write for descriptive brochure.



THE FOREST CITY FOUNDRIES COMPANY

2500 WEST 27th STREET • • CLEVELAND, OHIO

SPRAGUE INDUSTRIAL METERS

for

HIGH

and

LOW PRESSURE

INSTALLATIONS

THE ACME OF SIMPLICITY AND ACCESSIBILITY.

LESS MOVING PARTS THAN ANY METER ON THE MARKET.

DEPENDABILITY—ACCURACY—LONGER LIFE

& LOWER OPERATING COSTS

WRITE FOR NEW METER CATALOG
No. 16A

THE SPRAGUE METER CO., BRIDGEPORT, CONN.